United States
Department of
Agriculture

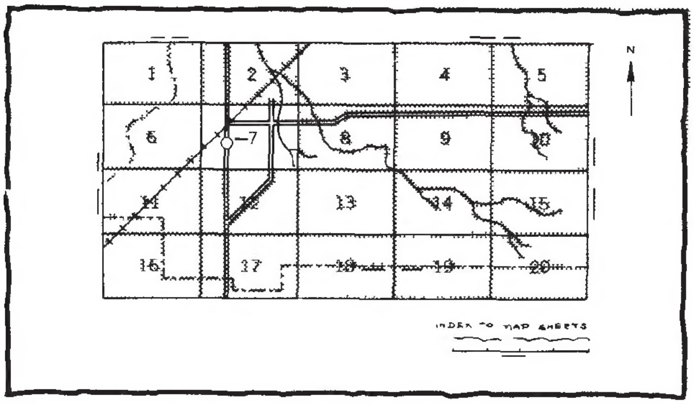
Soil
Conservation
Service

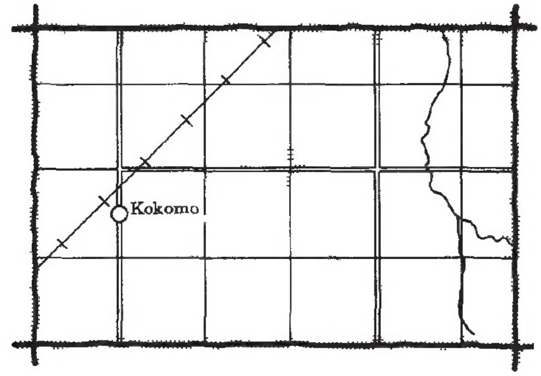
In cooperation with
Washington State
Department of Natural
Resources; Washington
State University
Agriculture Research
Center; and Clallam
County Commissioners

Soil Survey of Clallam County Area, Washington

HOW TO USE

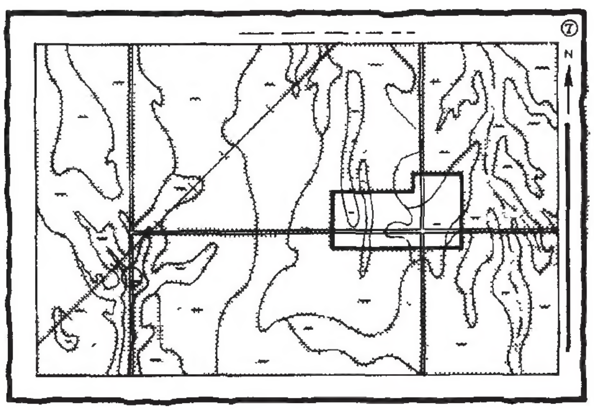
1. Locate your area of interest on the "Index to Map Sheets."

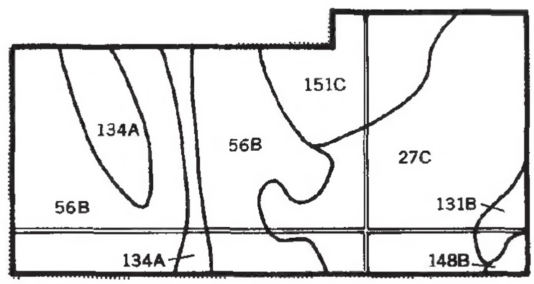




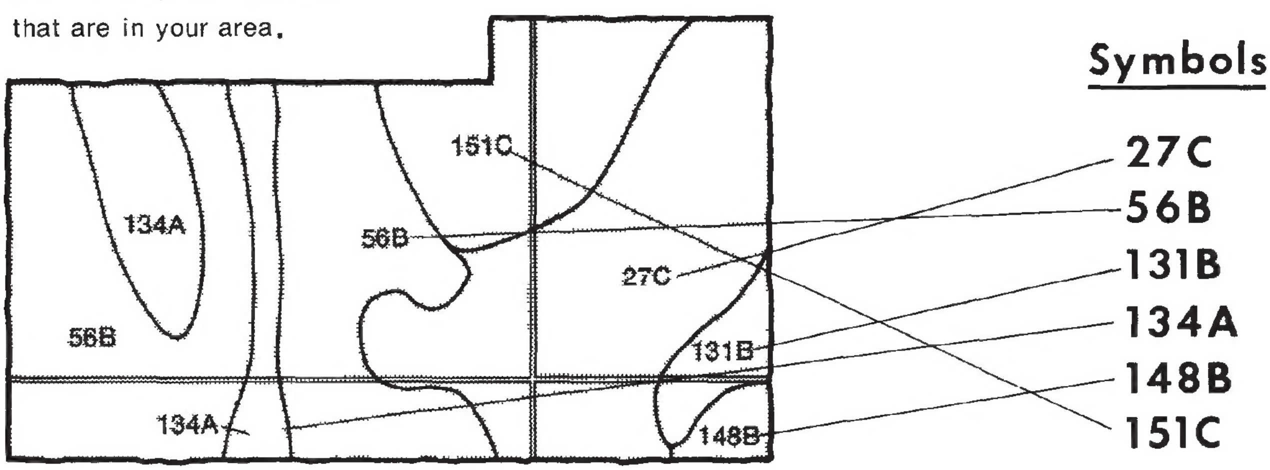
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



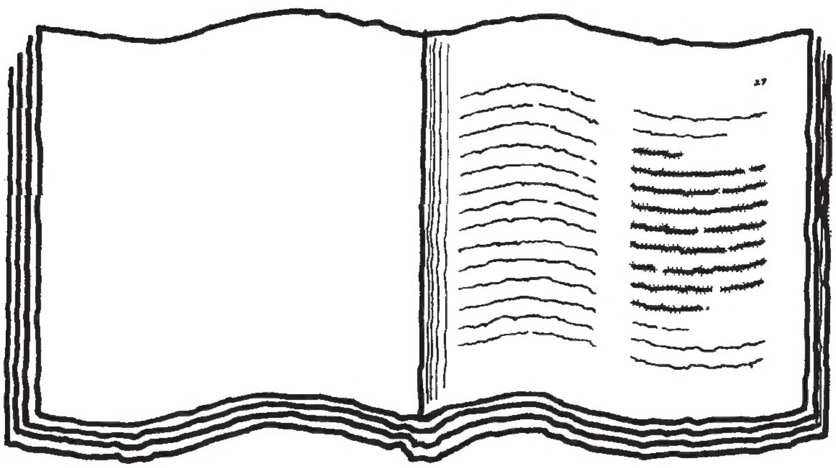


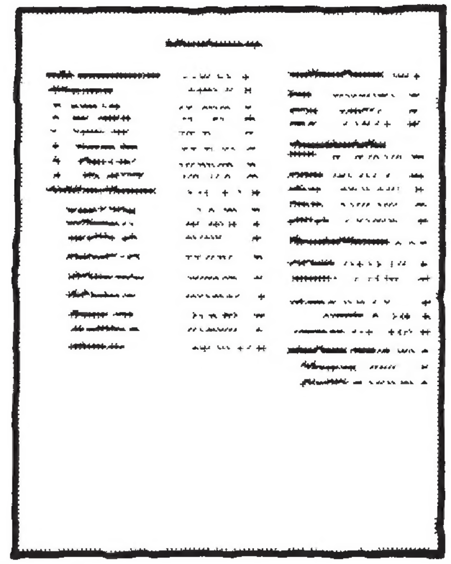
4. List the map unit symbols that are in your area.



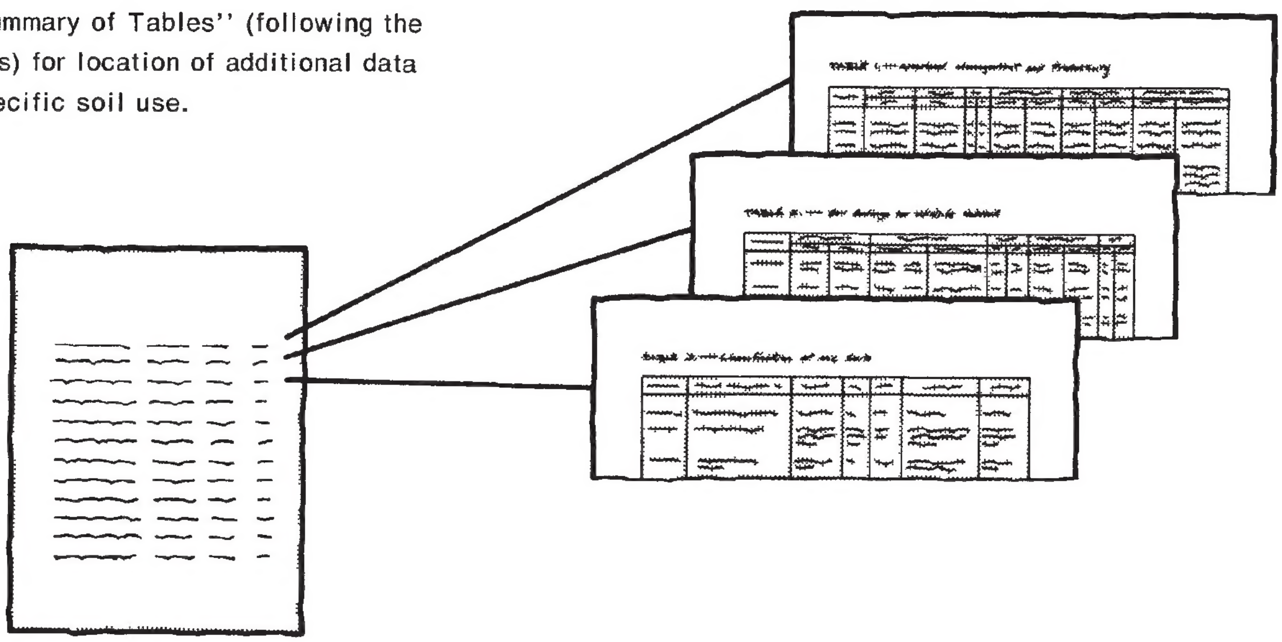
THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.





6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1979. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979. This survey was made cooperatively by the Soil Conservation Service, the Washington State Department of Natural Resources, and Washington State University Agriculture Research Center. The survey is part of the technical assistance furnished to the Clallam County Conservation District. Financial assistance was provided by the Clallam County Commissioners.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: General soil map unit 1 on terraces, flood plains, and alluvial fans in background; unit 6 on hills in foreground. The community of Carlsborg is to the left, and Sequim Valley Center is to the right.

Contents

Soil Series

Issued February 1987

Index to Map Units

Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Clallam County Area, Washington. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Lynn A. Brown

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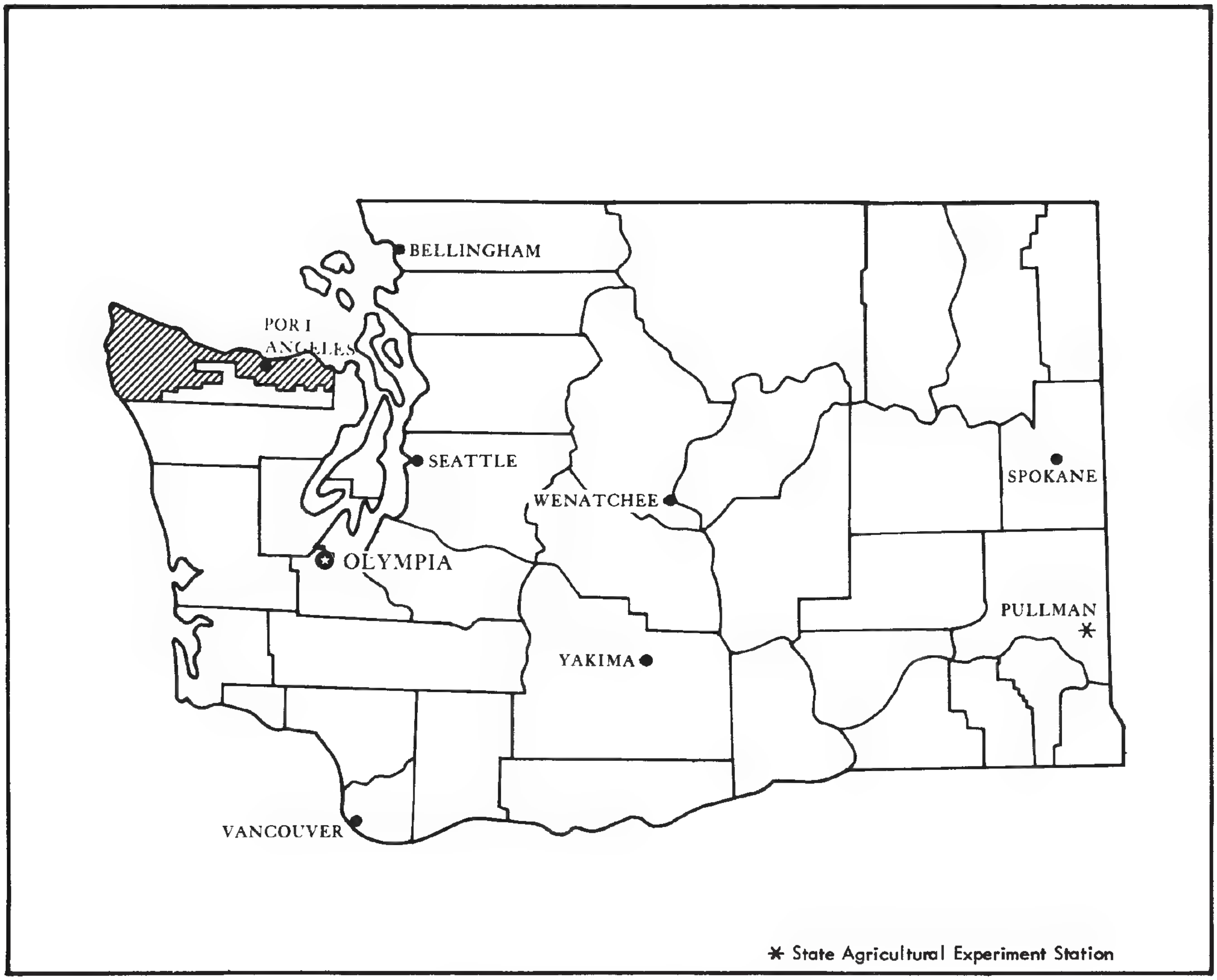
Soil Conservation Service



Location of Clallam County Area in Washington.

Soil Survey of
Clallam County Area, Washington

By Louis J. Halloin, Washington State Department of Natural Resources

Fieldwork by Louis J. Halloin, Norman R. Mofjeld, Oliver A. Chadwick, and
William Schmidt,
Washington State Department of Natural Resources, and
Mark Amara, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
In cooperation with
Washington State Department of Natural Resources;
Washington State University, Agriculture Research Center;
and Clallam County Commissioners

CLALLAM COUNTY AREA is at the northern end of the Olympic Peninsula. It has a total area of 617,680 acres, or about 965 square miles. Port Angeles is the county seat of Clallam County. Not included in this soil survey are the Olympic National Park, parts of the Olympic National Forest, some state-administered land, and the Makah and Quillayute Indian Reservations.

The topography in the survey area is quite variable. It ranges from that of broad, level river terraces to steep mountainsides. The Olympic Mountains occupy the south-central part of the survey area, and the rest of the area is characterized by steep foothills, glaciated uplands, and terraces. Elevation ranges from sea level to about 6,000 feet. The land in the survey area is used mainly for timber production, urban and residential development, and farming. The forest products industry is the main economic enterprise in the area. Timber is harvested for use as saw logs, pulp, shakes, and shingles. A vigorous log export market is also supplied. The communities in the western part of the area are supported primarily by logging, shake, and shingle operations. Pulp, newsprint, and lumber enterprises are mainly located in Port Angeles.

This soil survey replaces an earlier survey of Clallam County (*32*). It updates the earlier survey by providing more detailed information and current interpretations for land use planning. This survey joins the published soil survey of Jefferson County Area (*35*).

Descriptions, names, and delineations of soils in this soil survey do not fully agree with those on soil maps for adjacent survey areas. Differences are the result of better knowledge of soils, modifications in series concepts, intensity of mapping, or the extent of soils within the survey.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina

The climate of the Clallam County Area is greatly tempered by winds from the Pacific Ocean. Summers are fairly warm, but hot days are rare. Winters are cool, but snow and freezing temperatures are not common except at the higher elevations. During summer rainfall is extremely light, so crops growing actively during this period need irrigation. Several weeks often pass without precipitation. During the rest of the year rains are frequent, especially late in fall and in winter.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Port Angeles, Forks, and Sequim, Washington, in the period 1951 to 1978. Table 2 shows probable dates of the first freeze in fall

and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperatures at Port Angeles, Forks, and Sequim are 41, 40, and 40 degrees F, respectively. The average daily minimum temperature is 35 degrees at Port Angeles and 34 degrees at Forks and Sequim. The lowest temperature on record, which occurred at Forks on December 29, 1968, is 4 degrees. In summer, the average temperature is 59 degrees at Port Angeles and Forks and 60 degrees at Sequim. The average daily maximum temperature is about 69 degrees. The highest recorded temperature, which occurred at Forks on July 31, 1965, is 101 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 25 inches at Port Angeles, 118 inches at Forks, and 16 inches at Sequim. Of this, 25 percent usually falls in April through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was .85 inch at Forks on November 3, 1955. Thunderstorms occur on about 7 days each year, and most occur in winter.

The average seasonal snowfall is 6 to 8 inches at Port Angeles and Sequim and 15 inches at Forks. The greatest snow depth at any one time during the period of record was 23 inches. On an average, at least 1 inch of snow is on the ground for 1 to 2 days. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 70 percent. Humidity is higher at night, and the average at dawn is about 90 percent. The percentage of possible sunshine is 45 percent in summer and 20 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 8 miles per hour, in winter.

In most winters, one or two storms over the whole area bring strong and sometimes damaging winds, and in some years the accompanying heavy rains cause serious flooding. Every few years, either in winter or summer, a large invasion of a continental airmass from the east causes abnormal temperatures. In winter several consecutive days are well below freezing; in summer a week or longer is sweltering.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge gradually into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While the soil survey was in progress, samples of some of the soils in the area were collected for laboratory analyses and for engineering tests. Soil

scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses and under different levels of management. Some interpretations were modified to fit local conditions, and some new interpretations were developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biologic activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general map units in this survey have been grouped into general kinds of landscape for broad interpretive purposes. Each of the broad groups and the map units in each group are described in the following pages.

Soils on terraces, terrace escarpments, flood plains, and alluvial fans

Five map units are on these landscape positions. They make up about 24 percent of the survey area.

1. Carlsborg-Puget-Dungeness

Very deep, poorly drained, well drained, and somewhat excessively drained, nearly level and gently sloping soils; on terraces, flood plains, and alluvial fans

This map unit is in the eastern part of the survey area, on terraces of the Dungeness and Elwha Rivers. Rare periods of flooding occur on the lower terraces of the Dungeness River, and common periods of flooding occur on the Elwha River flood plain. Slope is 0 to 5 percent. The vegetation is mainly conifers, deciduous trees, and shrubs. Elevation is 10 to 650 feet. The average annual precipitation is 15 to 35 inches, the average annual air temperature is about 49 to 50 degrees F, and the average frost-free season is 170 to 200 days.

This unit makes up about 3 percent of the survey area. It is about 30 percent Carlsborg soils, 20 percent Puget soils, and 20 percent Dungeness soils. The remaining 30 percent is components of minor extent.

Carlsborg soils are on river terraces and alluvial fans. These soils are somewhat excessively drained. They formed in alluvium. The surface layer is gravelly sandy loam. The subsoil is very gravelly loamy sand. The substratum is extremely gravelly loamy sand, extremely cobbly loamy sand, and extremely gravelly sand.

Puget soils are on low river terraces and flood plains. These soils are poorly drained; however, drainage has been altered by ditching. The soils formed in alluvium. The surface layer is silt loam. The underlying material is mottled silty clay loam.

Dungeness soils are on low river terraces and flood plains. These soils are well drained. They formed in alluvium. The surface layer is silt loam. The upper 34 inches of the substratum is stratified silt loam, very fine sandy loam, and silty clay loam, and the lower part is stratified very fine sandy loam, fine sandy loam, fine sand, and medium sand.

Of minor extent in this unit are poorly drained Lummi soils, somewhat excessively drained Typic Xerofluvents that are nearly level and are on flood plains of the Elwha River, and areas of Riverwash along major river channels. Also of minor extent are small areas of somewhat poorly drained Agnew soils on terraces and moderately well drained Cassolary soils on hills.

This unit is used as hayland, pastureland, and cropland and for homesite development. The Carlsborg soils can be used as a source of sand and gravel.

The Puget and Dungeness soils are well suited to use as cropland. The Carlsborg soils are limited by droughtiness.

The main limitations of the unit for homesite development are the hazard of flooding and wetness. The main limitations for septic tank absorption fields are poor filtration of the Carlsborg soils and restricted permeability and wetness of the Puget soils. The Dungeness soils have few limitations.

2. Hoypus-Sequim-Agnew

Very deep, somewhat poorly drained and somewhat excessively drained, nearly level to very steep soils; on terraces, terrace escarpments, and alluvial fans

This map unit is in the eastern part of the survey area. Slope is 0 to 30 percent in areas on terraces and alluvial

fans and 30 to 65 percent in areas on terrace escarpments. The vegetation is mainly conifers, deciduous trees, and shrubs. Elevation is 20 to 1,000 feet. The average annual precipitation is 15 to 30 inches, the average annual air temperature is about 49 degrees F, the average frost-free season is 170 to 200 days, and the average growing season (at 28 degrees) is 220 to 260 days.

This unit makes up about 3 percent of the survey area. It is about 65 percent Hoypus soils, 10 percent Sequim soils, and 10 percent Agnew soils. The remaining 15 percent is components of minor extent.

Hoypus soils are on terraces and terrace escarpments. These soils are somewhat excessively drained. They formed in glacial outwash. The surface is covered with a mat of organic material. The surface layer and the upper part of the subsoil are gravelly sandy loam. The lower part of the subsoil is very gravelly loamy sand. The substratum is very gravelly sand and gravelly sand.

Sequim soils are on river terraces and alluvial fans. These soils are somewhat excessively drained. They formed in alluvium. The surface layer is very gravelly sandy loam. The underlying material is extremely cobbly loamy sand and extremely cobbly sand.

Agnew soils are on terraces. These soils are somewhat poorly drained. They formed in glaciomarine sediment. The surface layer is silt loam. The subsoil is mottled silty clay loam and clay loam. The substratum is mottled, stratified silty clay loam, silt loam, and sandy loam.

Of minor extent in this unit are somewhat excessively drained Dick soils and small areas of poorly drained Bellingham soils in depressional areas and moderately well drained Cassolary soils on hills.

This unit is used as hayland, pastureland, and cropland and for homesite development. The Hoypus and Sequim soils can be used as a source of sand and gravel.

The main limitations of this unit for hay and pasture are droughtiness of the surface layer of the Sequim soils and wetness of the Agnew soils. The Hoypus soils generally are not used for hay and pasture. The main limitations for homesite development are steepness of slope of the Hoypus soils, large stones on the Sequim soils, and wetness of the Agnew soils. The main limitations for septic tank absorption fields are poor filtration of the Sequim soils, steepness of slope and poor filtration of the Hoypus soils, and wetness and restricted permeability of the Agnew soils.

3. Neilton-Lyre-Casey

Very deep, somewhat poorly drained, somewhat excessively drained, and excessively drained, nearly level to very steep soils; on terraces and terrace escarpments

This map unit is in the central part of the survey area. Slope is 0 to 30 percent in areas on terraces and 30 to 70 percent in areas on terrace escarpments. The vegetation is mainly conifers, deciduous trees, and shrubs. Elevation is near sea level to 1,600 feet. The average annual precipitation is 30 to 90 inches, the average annual air temperature is 48 to 50 degrees F, the average frost-free season is 160 to 200 days, and the average growing season (at 28 degrees) is 220 to 250 days.

This unit makes up about 4 percent of the survey area. It is about 60 percent Neilton soils, 15 percent Lyre soils, and 10 percent Casey soils. The remaining 15 percent is components of minor extent.

Neilton soils are on terraces and terrace escarpments. These soils are excessively drained. They formed in glacial outwash. The surface is covered with a mat of organic material. The surface layer is very gravelly sandy loam. The subsoil is very gravelly loamy sand. The substratum is extremely gravelly sand.

Lyre soils are on terraces and terrace escarpments. These soils are somewhat excessively drained. They formed in glacial outwash. The surface is covered with a mat of organic material. The surface layer and subsoil are very gravelly sandy loam. The substratum is extremely gravelly sand.

Casey soils are on terraces. These soils are somewhat poorly drained. They formed in stratified glaciolacustrine and marine sediment. The surface layer is silty clay loam. The subsoil is mottled silty clay. The substratum is mottled silty clay loam.

Of minor extent in this unit are small areas of Bellingham soils in depressional areas.

This unit is used mainly as woodland. It is also used for homesite development. The Neilton and Lyre soils can be used as a source of sand and gravel.

The main limitations of this unit for use as woodland and for homesite development are steepness of slope of the Neilton and Lyre soils and wetness of the Casey soils. The main limitations for septic tank absorption fields are poor filtration and steepness of slope of the Neilton and Lyre soils and wetness and restricted permeability of the Casey soils.

4. Queets-Tealwhit

Very deep, well drained and poorly drained, nearly level and gently sloping soils; on low terraces and flood plains

This map unit is in the western part of the survey area. It is on low terraces and flood plains of the major rivers, including the Quillayute, Bogachiel, Calawah, Soleduck, and Hoko Rivers. Rare or occasional periods of flooding occur on the low terraces. Slope is 0 to 5 percent. The vegetation is mainly conifers, deciduous trees, shrubs, and sedges. Elevation is 20 to 1,200 feet. The average annual precipitation is 80 to 140 inches, the average annual air temperature is 49 to 51 degrees F, the average frost-free season is 160 to 190 days, and the

average growing season (at 28 degrees) is 210 to 250 days.

This unit makes up about 6 percent of the survey area. It is about 45 percent Queets soils and 40 percent Tealwhit soils. The remaining 15 percent is components of minor extent.

Queets soils are on low terraces and flood plains. These soils are well drained. They formed in silty alluvium. The surface is covered with a mat of organic material. The surface layer and subsoil are silt loam.

Tealwhit soils are on low terraces and flood plains. These soils are poorly drained. They formed in alluvium. The surface is covered with a mat of organic material. The surface layer is silt loam. The subsoil is mottled silty clay loam. The substratum is mottled very fine sandy loam.

Of minor extent in this unit are well drained Hoh soils and Riverwash along major river channels.

This unit is used mainly as woodland. The Queets soils are also used for hay, pasture, and homesite development.

This unit is well suited to use as woodland. The main limitation for homesite development and septic tank absorption fields is the hazard of flooding.

5. Solduc-Klone-Calawah

Very deep, well drained and somewhat excessively drained, nearly level to very steep soils; on terraces and terrace escarpments

This map unit is in the southwestern part of the survey area, on terraces of the Quillayute, Bogachiel, Calawah, and Soleduck Rivers. Slope is 0 to 15 percent in areas on terraces and 30 to 65 percent in areas on terrace escarpments (fig. 1). The vegetation is mainly conifers and shrubs. Elevation is 50 to 1,200 feet. The average annual precipitation is 0 to 130 inches, the average annual air temperature is 48 to 50 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

This unit makes up about 8 percent of the survey area. It is about 50 percent Solduc soils, 30 percent Klone soils, and 10 percent Calawah soils. The remaining 10 percent is components of minor extent.

Solduc soils are on terraces. These soils are somewhat excessively drained. They formed in glacial outwash that has loess and volcanic ash in the upper part. The surface is covered with a mat of organic material. The surface layer and subsoil are very gravelly sandy loam. The substratum is extremely gravelly loamy sand and extremely gravelly sand.

Klone soils are on terraces and terrace escarpments. These soils are well drained. They formed in poorly sorted glacial outwash. The surface is covered with a mat of organic material. The surface layer and subsoil are very gravelly loam. The substratum is extremely gravelly loamy sand.

Calawah soils are on terraces. These soils are well drained. They formed in loess and old alluvium overlying glacial outwash. The surface is covered with a mat of organic material. The surface layer is silt loam. The upper part of the subsoil is silty clay loam, and the lower part is gravelly silty clay loam.

Of minor extent in this unit are well drained Quillayute and Wellman soils.

This unit is used mainly as woodland. The Solduc and Klone soils can also be used as a source of sand and gravel.

The main limitation of this unit for use as woodland is steepness of slope. The Solduc soils are well suited to homesite and urban development. The main limitation for septic tank absorption fields is poor filtration.

Soils on hills

Three map units are on these landscape positions. They make up about 42 percent of the survey area.

6. Elwha-Clallam-Catla

Shallow and moderately deep, moderately well drained, nearly level to steep soils; on hills

This map unit is in the eastern part of the survey area (fig. 2). Slope is 0 to 35 percent. The vegetation is mainly conifers and shrubs. Elevation is 40 to 2,000 feet. The average annual precipitation is 16 to 45 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 260 days.

This unit makes up about 13 percent of the survey area. It is about 55 percent Elwha soils, 30 percent Clallam soils, and 10 percent Catla soils. The remaining 5 percent is components of minor extent.

Elwha soils are on hills. These soils are moderately deep. They formed in glacial till. The surface is covered with a mat of organic material. The surface layer is gravelly sandy loam. The subsoil is mottled gravelly sandy loam. Compact glacial till is at a depth of 33 inches.

Clallam soils are on hills. These soils are moderately deep. They formed in compact glacial till. The surface is covered with a thin mat of organic material. The surface layer is gravelly sandy loam. The subsoil is mottled gravelly sandy loam and very gravelly sandy loam. Compact glacial till is at a depth of 28 inches.

Catla soils are on hills. These soils are shallow. They formed in compact glacial till. The surface is covered with a mat of organic material. The surface layer is mottled gravelly sandy loam. The subsoil is mottled gravelly sandy loam. Compact glacial till is at a depth of 14 inches.

Of minor extent in this unit are moderately well drained Cassolary, Clallam Variant, and Yeary soils. Also of minor extent are small areas of poorly drained

Figure 1.—General soil map unit 5 on the broad, nearly level terraces in center and on terrace escarpments in foreground. Unit 9 on foothills in background.

Bellingham, McKenna, and Mukilteo soils in depressional areas and drainageways.

This unit is used mainly as woodland. It is also used for homesite development. The Clallam soils are also used for hay and pasture.

The main limitations of this unit for homesite development and septic tank absorption fields are wetness, steepness of slope, and depth to compact glacial till. The main limitation of the Clallam soils for hay and pasture is droughtiness.

7. Schnorbush-Sadie

Moderately deep and very deep, moderately well drained and well drained, nearly level to extremely steep soils; on hills

This map unit is in the central part of the survey area. Slope is mainly 0 to 55 percent, but it is as much as 80 percent in some areas. The vegetation is mainly conifers, deciduous trees, and shrubs. Elevation is 200 to 1,400 feet. The average annual precipitation is 40 to 75 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 260 days.

This unit makes up about 4 percent of the survey area. It is about 40 percent Schnorbush soils and 40 percent Sadie soils. The remaining 20 percent is components of minor extent.

Schnorbush soils are on hills. These soils are very deep and well drained. They formed in glacial till and residuum derived from siltstone. The surface is covered with a mat of organic material. The surface layer and subsoil are loam. The substratum is silty clay loam and loam.

Sadie soils are on hills. These soils are moderately deep and moderately well drained. They formed in glacial till. The surface is covered with a mat of organic material. The surface layer is gravelly loam. The subsoil is mottled gravelly loam. Compact glacial till is at a depth of 30 inches.

Of minor extent in this unit are small areas of poorly drained Bellingham soils in depressional areas and somewhat poorly drained Casey soils on terraces.

This unit is used mainly as woodland. A few areas are used for homesite development.

The main limitation of this unit for use as woodland is steepness of slope. The main limitation of the Schnorbush soils for homesite development is steepness of slope. The main limitation of these soils for septic tank absorption fields is the restricted permeability. The Sadie soils generally are not used for homesite development.

Figure 2.—General soil map unit 6 on hills in foreground. Unit 1 on terraces, flood plains, and alluvial fans in background. The community of Carlsborg is on left and Sequim Valley Center on right.

8. Ozette-Kydaka

Moderately deep and deep, moderately well drained and poorly drained, nearly level to steep soils; on hills

This map unit is in the western part of the survey area. Slope is 0 to 35 percent. The vegetation is mainly conifers and shrubs. Elevation is 100 to 1,800 feet. The average annual precipitation is 75 to 120 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

This unit makes up about 25 percent of the survey area. It is about 75 percent Ozette soils and 10 percent Kydaka soils. The remaining 15 percent is components of minor extent.

Ozette soils are on hills. These soils are deep and moderately well drained. They formed in loess and glacial till derived dominantly from sandstone and siltstone. The surface is covered with a layer of organic material. The surface layer is silt loam. The subsoil is mottled gravelly loam. Compact glacial till is at a depth of 42 inches.

Kydaka soils are in basins on hills. These soils are moderately deep and poorly drained. They formed in loess and glacial drift over compact glacial till. The surface is covered with a mat of organic material. The surface layer is silty clay loam. The subsoil is mottled silty clay loam and gravelly clay loam. The substratum is gravelly loam. Compact glacial till is at a depth of 30 inches.

Of minor extent in this unit are somewhat poorly drained Zeeka soils and well drained Andeptic Udorthents, very steep, in incised drainageways. Also of minor extent are small areas of poorly drained Tealwhit soils on low terraces and flood plains.

This unit is used mainly as woodland. The main limitation for harvesting timber is seasonal soil wetness. Restricted access limits other uses.

Soils on foothills

One map unit is on these landscape positions. It makes up about 12 percent of the survey area.

9. Palix-Ilwaco

Deep and very deep, well drained, moderately steep to extremely steep soils; on foothills

This map unit is in the northwestern part of the survey area. Slope is 15 to 90 percent. The vegetation is mainly conifers and shrubs. Elevation is at sea level to 1,800 feet. The average annual precipitation is 70 to 120 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

This unit makes up about 12 percent of the survey area. It is about 70 percent Palix soils and 20 percent Ilwaco soils. The remaining 10 percent is components of minor extent.

Palix soils are on foothills. These soils are deep. They formed in material weathered from siltstone and very fine sandstone. The surface is covered with a layer of organic material. The surface layer is loam. The subsoil is silty clay loam. The substratum is clay loam. Fractured, soft siltstone is at a depth of 44 inches.

Ilwaco soils are on foothills. These soils are very deep. They formed in material weathered from sandstone and loess. The surface is covered with a layer of organic material. The surface layer and subsoil are silt loam.

Of minor extent in this unit are small areas of moderately well drained Ozette soils on hills and well drained Snahopish soils on mountainsides.

This unit is used as woodland. The main limitation is steepness of slope. Landslides are common on the Palix soils, along the Strait of Juan de Fuca.

Soils on mountains

Two map units are on these landscape positions. They make up about 22 percent of the survey area.

10. Terbies-Louella

Deep and very deep, well drained, moderately steep to extremely steep soils; on mountainsides

This map unit is in the southeastern and south-central parts of the survey area. Slope is 10 to 90 percent. The vegetation is mainly conifers and shrubs. Elevation is 200 to 2,000 feet. The average annual precipitation is 30 to 70 inches, the average annual air temperature is 46 to 48 degrees F, and the average growing season (at 28 degrees) is 210 to 260 days.

This unit makes up about 8 percent of the survey area. It is about 45 percent Terbies soils and 40 percent Louella soils. The remaining 15 percent is components of minor extent.

Terbies soils are deep. These soils are steep to extremely steep and are on mountainsides in the south-central part of the survey area. The soils formed in residuum and colluvium derived from sandstone, siltstone, and conglomerate. The surface is covered with a mat of organic material. The surface layer is very gravelly sandy loam. The subsoil is very gravelly, extremely gravelly, and extremely channery sandy loam. The substratum is extremely channery sandy loam. Fractured sandstone is at a depth of 45 inches.

Louella soils are very deep. These soils are moderately steep to extremely steep and are on mountainsides in the southeastern part of the survey area. They formed in residuum and colluvium derived from basalt and flow breccia. The surface is covered with a mat of organic material. The surface layer is gravelly loam. The subsoil is gravelly clay loam and gravelly loam. The substratum is gravelly sandy loam.

Of minor extent in this unit are small areas of well drained Schnorbush soils on hills and somewhat excessively drained Dystric Xerorthents, bouldery, in hilly

areas of landslide debris. Also of minor extent are small areas of Rock outcrop consisting of basalt, conglomerate, and sandstone.

This unit is used mainly as woodland. Steepness of slope restricts access for other uses.

11. Snahopish-Solleks-Makah

Moderately deep and very deep, well drained, steep to extremely steep soils; on mountainsides

This map unit is in the western part of the survey area (fig. 3). Slope is 35 to 90 percent. The vegetation is mainly conifers and shrubs. Elevation is 300 to 2,000 feet. The average annual precipitation is 90 to 140 inches, the average annual air temperature is 45 to 47 degrees F, and the average growing season (at 28 degrees) is 210 to 240 days.

This unit makes up about 14 percent of the survey area. It is about 45 percent Snahopish soils, 25 percent Solleks soils, and 20 percent Makah soils. The remaining 10 percent is components of minor extent.

Snahopish soils are on mountainsides. These soils are very deep. They formed in material derived from sandstone. The surface is covered with a mat of organic material. The surface layer is very gravelly loam. The subsoil is very cobbly loam. The substratum is extremely cobbly loam.

Solleks soils are on mountainsides. These soils are moderately deep. They formed in residuum and colluvium derived from sandstone and conglomerate. The surface is covered with a mat of organic material. The surface layer is very gravelly loam. The subsoil is very cobbly loam and extremely cobbly loam. Sandstone is at a depth of 33 inches.

Makah soils are on mountainsides. These soils are very deep. They formed in residuum and colluvium derived from basalt. The surface is covered with a mat of

Figure 3.—Rounded, glaciated, *U*-shaped valley in general soil map unit 11.

organic material. The surface layer and subsoil are gravelly loam. The substratum is very gravelly loam.

Of minor extent in this unit are well drained Hyas soils and small areas of well drained Palix soils on foothills. Also of minor extent are small areas of Rock outcrop consisting of basalt, conglomerate, and sandstone.

This unit is used as woodland. Steepness of slope limits access for other uses. Instability of the soils is a concern in areas of road cuts.

Broad Land Use Considerations

The survey area is used mainly as forest land, as farmland, and as residential and urban land. These land uses are directly influenced by soil suitability, climate, topography, and accessibility. Early land use within the area was also influenced by access to port facilities at Dungeness and Port Angeles.

Forest land makes up about 500,000 acres, or 81 percent, of the survey area. Simply stated, the forested areas are the areas least suited to other uses. Much of the forest land is on steep or moderately steep soils and in areas that are inaccessible for installation of commonly desired utilities and activities. General soil map units 10 and 11 are suited to use as forest land. These units are not suited to most other uses because of their steepness of slope. General soil map unit 6 is also dominantly forest land. The soils in this unit are shallow to moderately deep over very compact glacial till and have slopes of as much as 35 percent. This unit is accessible, and parts of it are farmed or used for homesite development. Suitability for farming is limited, but homesites can be developed if appropriate construction techniques and waste treatment and disposal systems are used.

The forest land in the area also serves as recreation areas and provides habitat for wildlife. Grouse, deer, elk, and bear commonly inhabit the forest land.

The major rivers in the survey area have their sources in areas of forested watershed. These rivers support a salmon and steelhead fishery and are sources of high quality irrigation water.

Farmland makes up about 62,000 acres, or 10 percent, of the survey area. Most of this acreage is in the Sequim-Dungeness Valley. Soils on terraces and flood plains are the most suitable ones for farming. These soils are in general soil map units 1 and 2. The productive farmland in the eastern part of the area requires irrigation.

Farmable soils are steadily being converted to residential and urban uses. Population growth and farm economics are encouraging this conversion at an increasing rate. Soils suitable for farming are commonly the soils most suitable for homesite development. The soils in the previously mentioned map units are in accessible areas having suitable topography and favorable climate for residential uses. Specially designed onsite sewage disposal systems are required on some farmable soils that have restricted permeability.

Urban and built-up land make up about 55,600 acres, or 9 percent, of the survey area. The most rapidly developing area is east of Port Angeles and north of the foothills. This area includes general soil map units 1, 2, and 6. Many of the soils in this area are not well suited to homesite development; however, topography, accessibility, and climate make this a desirable area for residential uses. The potential for ground water contamination from poorly designed septic tank absorption fields on the Carlsborg and Sequim soils is a definite hazard. Other pollution problem areas exist on slowly permeable soils, such as the Agnew and Puget soils, and on moderately deep soils that are underlain by very slowly permeable glacial till, such as the Clallam and Elwha soils. As development proceeds, less area will be available for agricultural uses.

Detailed Soil Map Units

The map units on the detailed maps at the back of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit is given under "Use and Management of the Soils."

A map unit on a detailed soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils and miscellaneous areas have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavior divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation to precisely define and locate the soils and miscellaneous areas is needed.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Clallam gravelly sandy loam, 0 to 15 percent slopes, is one of several phases in the Clallam series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called soil complexes.

A *soil complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Carlsborg-Dungeness complex, 0 to 5 percent slopes, is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Map Unit Descriptions

1—Agnew silt loam, 0 to 8 percent slopes. This very deep, somewhat poorly drained soil is on terraces. It formed in glaciomarine sediment. The native vegetation is mainly conifers and shrubs. Elevation is 50 to 400 feet. The average annual precipitation is 15 to 25 inches, and the average annual air temperature is about 49 degrees F. The average frost-free period is 170 to 200 days.

Typically, the surface layer is dark brown silt loam 8 inches thick. The subsoil is yellowish brown, dark yellowish brown, and light olive brown silty clay loam and clay loam 38 inches thick. The substratum to a depth of 60 inches or more is stratified, olive brown silty clay loam, silt loam, and sandy loam. In some areas of similar included soils, the surface layer is silty clay loam or loam.

Included in this unit are small areas of Bellingham, Cassolary, Dungeness, and Puget soils. Also included are small areas of Dick and Hoypus soils. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Agnew soil is slow. Available water capacity is high. Effective rooting depth is limited by a seasonal high water table that is at a depth of 2 to 4 feet from January through March. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly as pastureland and hayland. If drained, it is also used as cropland. Some areas are used as homesites.

If the unit is used for homesite development, the main limitation is wetness. Drainage is needed if roads and buildings are constructed. Excess water can be removed by using suitably designed drainage ditches. Excavation for roads and buildings increases the risk of erosion. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Use of this unit for septic tank absorption fields is limited by wetness and slow permeability. The limitation of slow permeability can be overcome by increasing the size of the absorption field. Constructing septic tank absorption fields when the soil is wet results in reduced infiltration. Use of heavy equipment during construction compacts the soil and thus reduces permeability, particularly during periods when the soil moisture content is high.

If this unit is used for hay and pasture, the main limitation is wetness. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Grazing when the soil is moist results in compaction of the surface layer, poor tilth, and excessive runoff.

If this unit is used for crops, the main limitation is wetness. Crops commonly grown on the unit include raspberries, small grain, and truck crops. Drainage can be used to lower the water table if suitable outlets are available. Operation of equipment when the soil is moist results in compaction, which restricts penetration of moisture and roots. The organic matter content can be maintained by using all crop residue, plowing under green manure crops, and using a suitable rotation. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on the surface helps to conserve moisture, maintain tilth, and control erosion.

Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 125, and on the basis of a 50-year site curve, the estimated mean site index is 95. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 70 is 122 cubic feet per acre per year. Trees of limited extent are red alder, western redcedar, western hemlock, and bigleaf maple. Among the common forest understory plants are salal, elderberry, western swordfern, and bedstraw.

Seedling establishment is the main concern in the production of timber. The low precipitation in summer and the soil wetness in winter contribute to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by red alder occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Trees occasionally are subject to windthrow because the rooting depth is restricted by the seasonal high water table.

The main limitation for harvesting timber is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is moist produces ruts and compacts the soil. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not available in areas of this unit.

This map unit is in capability subclass IIIw, irrigated and nonirrigated.

2—Andeptic Udorthents, very steep. These very deep, well drained soils are on escarpments on hills. They formed in ablation till and outwash derived from sandstone, siltstone, and basalt. Slope is 50 to 80 percent. The native vegetation is mainly conifers and shrubs. Elevation is 100 to 1,400 feet. The average annual precipitation is 80 to 120 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

No single profile is typical of Andeptic Udorthents, very steep, but one commonly observed in the survey area has a 2-inch thick mat of organic material on the surface. The surface layer is dark brown gravelly silt loam 7 inches thick. The substratum to a depth of 60 inches or more is yellowish brown and olive brown very gravelly sandy loam and very gravelly loamy sand. Those soils vary widely in texture within short distances.

Included in this unit are small areas of Klone, Makah, Palix, and Snahopish soils. Also included are small areas of soils that formed in glacial drift and have compact glacial till at varying depths and small areas of Tealwhit soils along stream bottoms. Included areas make up about 50 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Andeptic Udorthents is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is severe.

This unit is used as woodland.

This unit is suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 135, and on the basis of a 50-year site curve, the estimated mean site index is 105. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 209 cubic feet per acre per year. Among the trees of limited extent are Sitka spruce and western redcedar. Among the common forest understory plants are red huckleberry, salmonberry, western swordfern, deer fern, salal, and vine maple.

The main limitation for the harvesting of timber is steepness of slope. Cable yarding systems are suitable for use on this unit. Harvesting systems that lift logs entirely off the ground reduce the disturbance of the protective layer of duff. Unsurfaced roads are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is available in areas of this unit. During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion. Steep yarding paths and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation.

Seedling establishment is the main concern in the production of timber. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily. Reforestation can also be accomplished by planting western hemlock or Sitka spruce seedlings. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

This map unit is in capability subclass VIIe, nonirrigated.

3—Beaches. This map unit consists of long, narrow areas that are subject to ocean wave action. These areas are gravelly, cobbly, and sandy. They are mainly above the mean tide level, but they are swept by waves during storms. These areas are barren of vegetation.

Included in this unit are small areas of tidal marshland.

This unit is used for recreation.

This unit is in capability subclass VIIIw, nonirrigated.

4—Bellingham silty clay loam. This very deep, poorly drained soil is in basins on low terraces. It formed in alluvium. Slope is 0 to 3 percent. The native vegetation is mainly conifers, deciduous trees, shrubs, grasses, and sedges. Elevation is 20 to 600 feet. The average annual precipitation is 35 to 60 inches, the average annual air temperature is about 50 degrees F, and the average frost-free period is 170 to 200 days.

Typically, the surface layer is very dark gray silty clay loam 9 inches thick. The subsoil is dark gray and olive gray silty clay loam 34 inches thick. The substratum to a depth of 60 inches or more is very dark gray and gray silty clay loam. In some areas of similar included soils, the surface layer is silt loam, clay loam, or loam.

Included in this unit are small areas of Cassolary, McKenna, Mukilteo, and Puget soils. Also included are small areas of soils that have a gravelly or cobbly substratum. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Bellingham soil is slow. Available water capacity is high. Effective rooting depth is limited by a seasonal high water table that is at the surface to a depth of 1 foot below the surface from November through June. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used as pastureland and hayland. A few areas are used as homesites.

If this unit is used for hay and pasture, the main limitations are wetness and restricted permeability. Grazing when the soil is wet results in compaction of the surface layer and poor tilth. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Drainage can be used to reduce wetness if a suitable outlet is available. Use of equipment when the soil is wet results in compaction, which restricts penetration of moisture and roots.

If the soil in this unit is drained and used as cropland, the organic matter content can be maintained by using all crop residue, plowing under green manure crops, and using a suitable rotation. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on the surface helps to conserve moisture and maintain tilth.

This unit is suited to the production of red alder. On the basis of a 50-year site curve, the estimated mean

site index for red alder is 85. At the culmination of the mean annual increment (CMAI), the production of red alder at age 40 is 92 cubic feet per acre per year. Trees of limited extent include bigleaf maple, western redcedar, western hemlock, and Douglas-fir. Among the common forest understory plants are western swordfern, trailing blackberry, western brackenfern, thimbleberry, and salmonberry.

Seedling establishment is the main concern in the production of timber. The seasonal high water table reduces root respiration, which results in high mortality of seedlings. Reforestation can be accomplished by planting western redcedar seedlings. If seed trees are present, natural reforestation of red alder occurs readily. When openings are made in the canopy, invading brushy plants can prevent seedling establishment. Trees occasionally are subject to windthrow because the rooting depth is restricted by the seasonal high water table.

The main limitation for harvesting timber is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Unsurfaced roads are soft and sticky when wet, and they may be impassable during rainy periods. Rock for road construction is not available in areas of this unit.

This unit is poorly suited to homesite development. The main limitation is the seasonal high water table. Drainage is needed if roads and buildings are constructed. Buildings and roads should be designed to offset the limited ability of the soil to support a load. This unit is not suited to conventional septic tank absorption fields because of wetness and slow permeability.

This map unit is in capability subclass VIw, nonirrigated.

5—Calawah silt loam, 0 to 15 percent slopes. This very deep, well drained soil is on terraces over glacial outwash. It formed in loess and old alluvium. The native vegetation is mainly conifers and shrubs. Elevation is 100 to 1,200 feet. The average annual precipitation is 80 to 130 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

Typically, the surface is covered with a mat of needles, leaves, and twigs 2 inches thick. The upper part of the surface layer is very dark grayish brown and dark brown silt loam 10 inches thick, and the lower part is dark brown silty clay loam about 8 inches thick. The upper 28 inches of the subsoil is dark yellowish brown and yellowish brown silty clay loam, and the lower part to a depth of 60 inches or more is yellowish brown gravelly silty clay loam. In some areas of similar included soils, the surface layer is silty clay loam.

Included in this unit are small areas of Ilwaco, Klone, Kydaka, Ozette, and Tealwhit soils. Also included are small areas of moderately well drained soils and areas of Calawah soils that have slopes of more than 15 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Calawah soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight.

This unit is used as woodland.

This unit is suited to the production of western hemlock (fig. 4). On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 157, and on the basis of a 50-year site curve, the estimated mean site index is 111. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 249 cubic feet per acre per year. Among the trees of limited extent are western redcedar, Sitka spruce, red alder, and Douglas-fir. Among the common forest understory plants are salal, red huckleberry, evergreen huckleberry, vine maple, salmonberry, western swordfern, deer fern, and Oregon oxalis.

The main limitation for harvesting timber is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Cable yarding systems or low-ground-pressure skidding equipment can be used to minimize soil damage. Unsurfaced roads and skid trails are soft and slippery when wet, and they may be impassable during rainy periods. Cutbanks may slump when the soil is saturated. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not readily available within the upper 60 inches of the soil.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. Western hemlock, a shallow rooted tree, is subject to windthrow because of soil wetness. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily. Reforestation can also be accomplished by planting Douglas-fir or Sitka spruce seedlings. When openings are made in the canopy, invading brushy plants can delay seedling establishment.

This map unit is in capability subclass IIIe, nonirrigated.

6—Carlsborg gravelly sandy loam, 0 to 5 percent slopes. This very deep, somewhat excessively drained soil is on terraces and old alluvial fans. It formed in coarse textured alluvium. The native vegetation is mainly conifers and shrubs. Elevation is 50 to 500 feet. The average annual precipitation is 15 to 32 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is 170 to 200 days.

Typically, the surface layer is dark brown gravelly sandy loam 9 inches thick. The subsoil is dark brown very gravelly loamy sand 11 inches thick. The upper 17

Figure 4.—Mature second growth western hemlock in an area of Calawah silt loam, 0 to 15 percent slopes.

inches of the substratum is dark yellowish brown extremely gravelly loamy sand, the next 8 inches is yellowish brown extremely cobbly loamy sand, and the lower part to a depth of 60 inches or more is yellowish brown extremely gravelly sand. In some areas of similar included soils, the surface layer is gravelly loamy sand or cobbly sandy loam.

Included in this unit are small areas of Dungeness, Hoypus, and Sequim soils. Also included are small areas of soils that are gravelly sandy loam to a depth of more than 10 inches. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Carlsborg soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to rare periods of flooding.

This unit is used as hayland, pastureland, cropland, and homesites.

If this unit is used for hay and pasture, the main limitation is droughtiness. Irrigation is required for maximum production.

If this unit is used for crops, the main limitation is droughtiness. Crops commonly grown on this unit include strawberries, raspberries, small grain, and truck crops. In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. To avoid overirrigation and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Because the soil is droughty, applications of irrigation water should be light and frequent. The organic matter content can be maintained by using cover crops and a suitable rotation. Regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 95, and on the basis of a 50-year site curve, the estimated mean site index is 75. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 77 cubic feet per acre per year. Trees of limited extent include Pacific madrone. Among the common forest understory plants are salmonberry, western swordfern, Oregon-grape, salal, and oceanspray.

Seedling establishment is the main concern in the production of timber. The droughtiness of the surface layer and low precipitation in summer contribute to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings. When openings are made in the canopy, invading brushy plants can delay seedling establishment.

Logging roads require suitable surfacing for year-round use. Rounded gravel and cobbles for road construction are available in areas of this unit.

If this unit is used for homesite development, the main limitation is the hazard of flooding. Excavation for roads and buildings increases the hazard of erosion. Cutbanks are not stable and are subject to caving in.

Use of the soil in this unit for septic tank absorption fields is limited by the rapid permeability. The soil is a poor filter.

This map unit is incapability subclass VIs, irrigated and nonirrigated.

7—Carlsborg-Dungeness complex, 0 to 5 percent slopes. This map unit is on low terraces. The native vegetation is mainly conifers and shrubs. Elevation is 25 to 300 feet. The average annual precipitation is 17 to 25 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is 170 to 200 days.

The unit is 50 percent Carlsborg gravelly sandy loam and 30 percent Dungeness silt loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

The Carlsborg soil is very deep and somewhat excessively drained. It formed in coarse textured alluvium. Typically, the surface layer is dark brown gravelly sandy loam 9 inches thick. The subsoil is dark brown very gravelly loamy sand 11 inches thick. The upper 17 inches of the substratum is dark yellowish brown extremely gravelly loamy sand, the next 8 inches is yellowish brown extremely cobbly loamy sand, and the lower part to a depth of 60 inches or more is yellowish brown extremely gravelly sand. In some areas of similar included soils, the surface layer is gravelly loamy sand or cobbly sandy loam.

Permeability of this Carlsborg soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to rare periods of flooding.

The Dungeness soil is very deep and well drained. It formed in alluvium. Typically, the surface layer is very dark grayish brown silt loam 8 inches thick. The upper 34 inches of the substratum is stratified, very dark grayish brown and dark grayish brown silt loam, very fine sandy loam, and silty clay loam. The lower part to a depth of 60 inches or more is stratified, dark grayish brown and olive gray very fine sandy loam, fine sandy loam, fine sand, and medium sand. In some areas of similar included soils, the surface layer is fine sandy loam.

Permeability of the Dungeness soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight. This soil is subject to rare periods of flooding.

Included in this unit are small areas of Hoypus, Puget, and Sequim soils. Also included are small areas of Riverwash. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

This unit is used as hayland, pastureland, cropland, and homesites.

If the Carlsborg soil is used for hay and pasture, the main limitation is droughtiness. Irrigation is required for maximum production.

Crops commonly grown on the Carlsborg soil include strawberries and raspberries. In summer, irrigation is needed for maximum production of these crops.

Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Because this soil is droughty,

applications of irrigation water should be light and frequent. The organic matter content can be maintained by using all crop residue, plowing under green manure crops, and using a suitable rotation.

The Dungeness soil is well suited to hay and pasture. It has few limitations. Irrigation is required for maximum production. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

The Dungeness soil is well suited to irrigated crops. It has few limitations. Crops commonly grown on this soil include small grain, strawberries, raspberries, and truck crops. In summer, irrigation is needed for maximum production of most crops.

Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Use of equipment when the soil is wet results in compaction, which restricts penetration of moisture and roots. The organic matter content can be maintained by using all crop residue, plowing under green manure crops, and using a suitable rotation. Regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 95 on the Carlsborg soil and 152 on the Dungeness soil. On the basis of a 50-year site curve, the estimated mean site index is 75 on the Carlsborg soil and 115 on the Dungeness soil. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir is 77 cubic feet per acre per year at age 60 on the Carlsborg soil and 161 cubic feet per acre per year at age 60 on the Dungeness soil. Trees of limited extent include Pacific madrone on the Carlsborg soil and red alder on the Dungeness soil. Among the common forest understory plants are salmonberry, western swordfern, Oregon-grape, salal, and oceanspray on the Carlsborg soil and Oregon-grape, salmonberry, western swordfern, and bedstraw on the Dungeness soil.

Seedling establishment is the main concern in the production of timber. The droughtiness of the surface layer and low precipitation in summer contribute to seedling mortality on the Carlsborg soil. Reforestation can be accomplished by planting Douglas-fir seedlings. When openings are made in the canopy, invading brushy plants can delay seedling establishment.

There are no equipment limitations on the Carlsborg soil. The main limitation for harvesting timber on the Dungeness soil is muddiness when the soil is wet. Use of wheeled and tracked equipment on the Dungeness soil when wet produces ruts and compacts the soil. Unsurfaced roads on the Dungeness soil are soft when wet, and they may be impassable during rainy periods. Logging roads on this unit require suitable surfacing for year-round use. Rounded gravel and cobbles for road construction are available in areas of the Carlsborg soil.

The Carlsborg soil is well suited to homesite development. It is limited mainly by the rare periods of flooding. Excavation for roads and buildings increases the risk of erosion. Cutbanks are not stable and are subject to caving in.

Use of this soil for septic tank absorption fields is limited by rapid permeability; therefore, it is a poor filter.

If the Dungeness soil is used for homesite development, the main limitation is the hazard of flooding. Flooding can be controlled by use of dikes and channels that have outlets to bypass floodwater. Preserving the existing plant cover during construction helps to control erosion. Excavation for roads and buildings increases the risk of erosion. Cutbanks are not stable and are subject to caving in.

Use of this soil for septic tank absorption fields is limited by the moderate permeability. If the unit is used for septic tank absorption fields, the limitation of moderate permeability can be overcome by increasing the size of the absorption field. Use of heavy equipment during construction compacts the soil and thus reduces permeability, particularly during periods when the soil moisture content is high.

This map unit is in capability subclass IVs, irrigated and nonirrigated.

8—Casey silty clay loam, 0 to 10 percent slopes. This very deep, somewhat poorly drained soil is on terraces. It formed in stratified glaciolacustrine or marine sediment. The native vegetation is mainly conifers, deciduous trees, and shrubs. Elevation is 200 to 600 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is about 49 degrees F, the average frost-free period is 160 to 200 days, and the average growing season (at 28 degrees) is 230 to 260 days.

Typically, the surface layer is very dark grayish brown silty clay loam 8 inches thick. The subsoil is grayish brown, dark gray, and olive gray silty clay 28 inches thick. The substratum to a depth of 60 inches or more is stratified, olive silty clay loam to loamy fine sand. In some areas of similar included soils, the surface layer is loam, silt loam, or fine sandy loam.

Included in this unit are small areas of Bellingham, Elwha, McKenna, Mukilteo, and Schnorbush soils. Included areas make up about 20 percent of the total

acreage. The percentage varies from one area to another.

Permeability of this Casey soil is very slow. Available water capacity is moderately high. Effective rooting depth is limited by a seasonal perched water table that is at a depth of 2 to 4 feet from December through April. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used as woodland, hayland, and pastureland. A few areas are used as homesites.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 117, and on the basis of a 50-year site curve, the estimated mean site index is 94. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 110 cubic feet per acre per year. Trees of limited extent are red alder, western redcedar, western hemlock, and bigleaf maple. Among the common forest understory plants are salal, red huckleberry, blackberry, oceanspray, salmonberry, western swordfern, bedstraw, Indian plum, and western brackenfern.

The main limitation for harvesting timber is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Cable yarding systems can be used to minimize soil damage. Unsurfaced roads and skid trails are soft and sticky when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in areas of this unit.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir and western hemlock occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Trees occasionally are subject to windthrow because the rooting depth is restricted by the seasonal high water table.

If this unit is used for hay and pasture, the main limitation is wetness. Use of equipment when the soil is wet results in compaction, which restricts penetration of moisture and roots. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Excessive water on the surface can be removed by tile drains and ditches. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

If this unit is used for homesite development, the main limitation is wetness. Drainage is needed if roads and buildings are constructed. Excess water can be removed by using suitably designed drainage systems. Excavation for roads and buildings increases the risk of erosion. Cutbanks are not stable and are subject to caving in. Buildings and roads should be designed to offset the limited ability of the soil to support a load.

Use of this unit for septic tank absorption fields is limited by wetness and very slow permeability. Use of heavy equipment compacts the soil and reduces permeability, particularly during periods when the soil moisture content is high.

This map unit is in capability subclass IIIw, nonirrigated.

9—Cassolary fine sandy loam, 0 to 8 percent slopes. This very deep, moderately well drained soil is on hills. It formed in reworked glacial drift and marine sediment. The native vegetation is mainly conifers and shrubs. Elevation is 50 to 500 feet. The average annual precipitation is 16 to 30 inches, the average annual air temperature is about 50 degrees F, and the average frost-free period is 160 to 200 days.

Typically, the surface layer is dark brown fine sandy loam 8 inches thick. The subsoil is dark brown and brown very fine sandy loam and fine sandy loam 14 inches thick. The upper 14 inches of the substratum is olive brown loam, and the lower part to a depth of 60 inches or more is stratified, olive and olive brown very fine sandy loam and silt loam. In some areas of similar included soils, the surface layer is sandy loam.

Included in this unit are small areas of Agnew, Clallam, Dick, Hoypus, and Puget soils. Also included are small areas of soils that have a gravelly subsoil and substratum. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Cassolary soil is moderately slow. Available water capacity is moderately high. Runoff is slow to medium, and the hazard of water erosion is slight. A seasonal perched water table is at a depth of 3 to 4 feet from January through March.

This unit is used mainly as hayland, pastureland, and cropland. It is also used as homesites.

This unit is well suited to hay and pasture. It has few limitations. Irrigation is required for maximum production. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion.

This unit is well suited to irrigated crops. It has few limitations. Crops commonly grown on the unit include strawberries, raspberries, and small grain. In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. To avoid overirrigating and leaching of plant nutrients, applications

of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. The organic matter content can be maintained by using all crop residue, plowing under green manure crops, and using a suitable rotation. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Limiting tillage for seedbed preparation and weed control reduces runoff and erosion. All tillage should be on the contour or across the slope.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 145, and on the basis of a 50-year site curve, the estimated mean site index is 110. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 152 cubic feet per acre per year. Trees of limited extent are western redcedar and western hemlock. Among the common forest understory plants are salal, red huckleberry, twinflower, western brackenfern, and oceanspray.

Seedling establishment is the main concern in the production of timber. The low precipitation during the growing season and the droughtiness of the surface layer contribute to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

The main limitation for harvesting timber is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not available in areas of this unit.

If this unit is used for homesite development, the main limitation is wetness. Excavation for roads and buildings increases the risk of erosion. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load. Cutbanks are not stable and are subject to caving in.

Use of this unit for septic tank absorption fields is limited by moderately slow permeability and wetness. Constructing septic tank absorption fields when the soil is wet results in reduced infiltration. Use of heavy equipment during construction compacts the soil and reduces permeability, particularly during periods when the soil moisture content is high.

This map unit is in capability subclass IIe, irrigated and nonirrigated.

10—Catla gravelly sandy loam, 2 to 15 percent slopes. This shallow, moderately well drained soil is on hills. It formed in compact glacial till. The native vegetation is mainly conifers and shrubs. Elevation is 100 to 400 feet. The average annual precipitation is 18 to 25 inches, the average annual air temperature is about 49 degrees F, and the average growing season (at 28 degrees) is 230 to 260 days.

Typically, the surface is covered with a mat of organic material 1.5 inches thick. The surface layer is brown gravelly sandy loam 3 inches thick. The subsoil is brown gravelly sandy loam 11 inches thick. Compact glacial till is at a depth of 14 inches. Depth to compact glacial till ranges from 10 to 20 inches. In some areas of similar included soils, the surface layer is gravelly loam.

Included in this unit are small areas of Clallam, Dick, and Hoypus soils. Also included are small areas of soils that have compact glacial till at a depth of less than 10 inches and Catla soils that have slopes of more than 15 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Catla soil is moderate to the compact glacial till and very slow through it. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is slow, and the hazard of water erosion is moderate. Water is perched above the compact glacial till during January through May. The effect of the layer of glacial till on use and management is similar to that of a hardpan.

Most areas of this unit are used as woodland. A few areas are used as homesites.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 104, and on the basis of a 50-year site curve, the estimated mean site index is 82. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 89 cubic feet per acre per year. Trees of limited extent are western hemlock, western redcedar, grand fir, Pacific madrone, and red alder. Among the common forest understory plants are salal, evergreen huckleberry, creambush oceanspray, rhododendron, and manzanita. Floral use of salal and evergreen huckleberry is common on this unit.

The main limitation for harvesting timber is muddiness when the soil is wet. The seasonal perched high water table can limit the use of equipment to dry periods. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not available in areas of this unit.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. The low precipitation during the growing season and low available water capacity contribute to seedling mortality. Reforestation can be accomplished by planting Douglas-

fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically and by red alder it occurs readily. When openings are made in the canopy, invading brushy plants can prevent the establishment of seedlings. Because the rooting depth is restricted by the compact glacial till, trees frequently are subject to windthrow.

This unit is poorly suited to homesite development. The main limitations are wetness and the depth to the compact glacial till.

Use of this unit for septic tank absorption fields is limited by depth to the compact glacial till and wetness. The restricted permeability and the high water table increase the possibility of failure of septic tank absorption fields.

This map unit is in capability subclass VIe, nonirrigated.

11—Catla-Hoypus complex, 2 to 65 percent slopes. This map unit is on hills and terrace escarpments. The native vegetation is mainly conifers and shrubs. Elevation is 100 to 400 feet. The average annual precipitation is 18 to 25 inches, the average annual air temperature is about 49 degrees F, and the average growing season (at 28 degrees) is 230 to 260 days.

The unit is 40 percent Catla gravelly sandy loam, 2 to 15 percent slopes, and 40 percent Hoypus gravelly loamy sand, 30 to 65 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

The Catla soil is shallow and moderately well drained. It formed in compact glacial till. Typically, the surface is covered with a mat of organic material 1.5 inches thick. The surface layer is brown gravelly sandy loam 3 inches thick. The subsoil is brown gravelly sandy loam 11 inches thick. Compact glacial till is at a depth of 14 inches. Depth to compact glacial till ranges from 10 to 20 inches. In some areas of similar included soils, the surface layer is gravelly loam.

Permeability of the Catla soil is moderate to the glacial till and very slow through it. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is slow, and the hazard of water erosion is moderate. Water is perched above the compact glacial till from January through May. The effect of the layer of glacial till on use and management is similar to that of a hardpan.

The Hoypus soil is very deep and somewhat excessively drained. It formed in glacial outwash. Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark brown gravelly loamy sand 4 inches thick. The subsoil is brown and grayish brown gravelly loamy sand 11 inches thick. The substratum to a depth of 60 inches or more is brown very gravelly sand. In some areas of similar included soils, the surface layer is gravelly sandy loam or very gravelly sandy loam.

Permeability of the Hoypus soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is severe.

Included in this unit are small areas of Agnew, Clallam, and Dick soils. Also included are small areas of soils that have compact glacial till at a depth of less than 10 inches and soils that have slopes of more than 65 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Most areas of this unit are used as woodland. A few areas of the Catla soil are used as homesites.

The Catla soil is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 104, and on the basis of a 50-year site curve, the estimated mean site index is 82. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 89 cubic feet per acre per year. The trees of limited extent are western hemlock, grand fir, western redcedar, Pacific madrone, and red alder. Among the common forest understory plants are salal, evergreen huckleberry, creambush oceanspray, rhododendron, and manzanita. Floral use of salal and evergreen huckleberry is common on this soil.

The main limitation for harvesting timber on the Catla soil is muddiness when the soil is wet. The seasonal perched water table may limit the use of equipment to dry periods. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not available in areas of the Catla soil.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber on the Catla soil. The low precipitation during the growing season and low available water capacity contribute to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically and by red alder it occurs readily. When openings are made in the canopy, invading brushy plants can prevent the establishment of seedlings. Because the rooting depth is restricted by the compact glacial till, trees frequently are subject to windthrow.

The Hoypus soil is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 134, and on the basis of a 50-year site curve, the estimated mean site index is 101. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 70 is 136 cubic feet per acre per year. The trees of

limited extent are western hemlock, western redcedar, bigleaf maple, and Pacific madrone. Among the common forest understory plants are salal, Oregon-grape, red huckleberry, western brackenfern, blackberry, western swordfern, and deer fern.

The main limitation for harvesting timber on the Hoypus soil is steepness of slope. Steepness of slope restricts the use of wheeled and tracked equipment in skidding operations; cable yarding systems generally are safer and disturb the soil less. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Logging roads require suitable surfacing for year-round use. Rounded gravel for road construction is readily available in areas of the Hoypus soil. During the first few years following road construction in combination with harvesting, road failures and landslides are likely to occur. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment is the main concern in the production of timber. The low precipitation during the growing season and droughtiness of the surface layer cause high mortality of seedlings, especially on south- and southwest-facing slopes. Reforestation can be accomplished by planting Douglas-fir seedlings. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

The Catla soil is poorly suited to homesite development. The main limitations are steepness of slope, wetness, and depth to the compact glacial till.

Use of this soil for septic tank absorption fields is limited by depth to the glacial till and wetness. The restricted permeability and the high water table increase the possibility of failure of septic tank absorption fields.

This map unit is in capability subclass VIIe, nonirrigated.

12—Clallam gravelly sandy loam, 0 to 15 percent slopes. This moderately deep, moderately well drained soil is on hills. It formed in compact glacial till. The native vegetation is mainly conifers and shrubs. Elevation is 40 to 1,800 feet. The average annual precipitation is 16 to 30 inches, the average annual air temperature is about 48 degrees F, the average frost-free period is 160 to 200 days, and the average growing season (at 28 degrees) is 210 to 260 days.

Typically, the surface is covered with a mat of organic material 2.5 inches thick. The surface layer, where mixed to a depth of 6 inches, is dark brown gravelly sandy loam. The upper part of the subsoil is brown gravelly sandy loam about 4 inches thick, and the lower part is brown very gravelly sandy loam about 18 inches thick. Compact glacial till is at a depth of 28 inches. Depth to compact glacial till ranges from 20 to 40 inches. In some areas of similar included soils, the surface layer is sandy loam or very gravelly sandy loam.

Included in this unit are small areas of Catla, Dick, Elwha, Hoypus, McKenna, Mukilteo, and Yeary soils. Also included are small areas of Clallam soils that have slopes of more than 15 percent and soils that are more than 40 inches deep to compact glacial till. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Clallam soil is moderate to the compact glacial till and very slow through it. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. Water is perched above the compact glacial till from January through April. The effect of the layer of compact glacial till on use and management is similar to that of a hardpan.

This unit is used mainly as woodland. It is also used as hayland, pastureland, cropland, and homesites.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 130, and on the basis of a 50-year site curve, the estimated mean site index is 98. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 70 is 130 cubic feet per acre per year. The trees of limited extent are western hemlock, grand fir, western redcedar, red alder, and Pacific madrone. Among the common forest understory plants are salal, evergreen huckleberry, red huckleberry, Oregon-grape, oceanspray, twinflower, blackberry, western swordfern, and western brackenfern. Floral use of salal, evergreen huckleberry, and western swordfern is common on this unit.

This unit is suited to year-round harvesting operations. Logging roads require suitable surfacing. Rock for road construction is not available in areas of this unit.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. The low precipitation during the growing season and low available water capacity contribute to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Because the rooting depth is restricted by the compact glacial till, trees occasionally are subject to windthrow.

If this unit is used for hay and pasture, the main limitations are steepness of slope and droughtiness. Seedbed preparation should be on the contour or across the slope where practical. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion.

If this unit is used for crops, it is limited mainly by steepness of slope and low available water capacity.

Crops commonly grown on this unit include strawberries, raspberries, and small grain. In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied carefully to prevent the buildup of a high water table. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. The organic matter content can be maintained by using all crop residue and using a suitable rotation.

Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on the surface helps to conserve moisture, maintain tilth, and control erosion. Limiting tillage for seedbed preparation and weed control reduces runoff and erosion. All tillage should be on the contour or across the slope.

If this unit is used for homesite development, the main limitation is wetness. Excavation for roads and buildings increases the risk of erosion.

Use of this unit for septic tank absorption fields is limited by wetness and depth to the compact glacial till. Because of the depth to glacial till, onsite sewage disposal systems often fail to function properly during periods of high rainfall. Use of heavy equipment during construction compacts the soil and reduces permeability, particularly during periods when the soil moisture content is high. Absorption lines should be installed on the contour to prevent surfacing of effluent in downslope areas.

This map unit is in capability subclass IIIe, irrigated, and IVe, nonirrigated.

13—Clallam gravelly sandy loam, 15 to 30 percent slopes. This moderately deep, moderately well drained soil is on hills. It formed in compact glacial till. The native vegetation is mainly conifers and shrubs. Elevation is 40 to 1,800 feet. The average annual precipitation is 16 to 30 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 260 days.

Typically, the surface is covered with a mat of organic material 2.5 inches thick. The surface layer, where mixed to a depth of 6 inches, is dark brown gravelly sandy loam. The upper part of the subsoil is brown gravelly sandy loam about 4 inches thick, and the lower part is brown very gravelly sandy loam about 18 inches thick. Compact glacial till is at a depth of 28 inches. Depth to glacial till ranges from 20 to 40 inches. In some areas of similar included soils, the surface layer is sandy loam or very gravelly sandy loam.

Included in this unit are small areas of Dick, Elwha, Hoypus, Louella, and Yeary soils. Also included are small areas of Clallam soils that have slopes of less than 15 percent or more than 30 percent and soils that are more than 40 inches deep to compact glacial till. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Clallam soil is moderate to the compact glacial till and very slow through it. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. Water is perched above the compact glacial till from January through April. The effect of the layer of glacial till on use and management is similar to that of a hardpan.

This unit is used mainly as woodland. It is also used as homesites.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 130, and on the basis of a 50-year site curve, the estimated mean site index is 98. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 70 is 130 cubic feet per acre per year. The trees of limited extent are western hemlock, grand fir, western redcedar, red alder, and Pacific madrone. Among the common forest understory plants are salal, evergreen huckleberry, red huckleberry, Oregon-grape, oceanspray, twinflower, blackberry, western swordfern, and western brackenfern. Floral use of salal, evergreen huckleberry, and western swordfern is common on this unit.

This unit is suited to year-round harvesting operations. Logging roads require suitable surfacing. Rock for road construction is not available in areas of this unit.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. The low precipitation during the growing season and low available water capacity contribute to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Because the rooting depth is restricted by the compact glacial till, trees are occasionally subject to windthrow.

If this unit is used for homesite development, the main limitations are steepness of slope and wetness. Excavation for roads and buildings increases the risk of erosion.

Use of this unit for septic tank absorption fields is limited by steepness of slope, wetness, and depth to the compact glacial till. Because of the depth to glacial till, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Use of heavy equipment when the soil moisture content is high compacts the soil and thus reduces permeability. The steepness of slope is a concern when installing septic

tank absorption fields. Absorption lines should be installed on the contour.

This map unit is in capability subclass IVe, nonirrigated.

14—Clallam-Hoypus gravelly sandy loams, 0 to 15 percent slopes. This map unit is on hills and outwash terraces. The native vegetation is mainly conifers and shrubs. Elevation is 100 to 400 feet. The average annual precipitation is 25 to 30 inches, the average annual air temperature is about 48 degrees F, and the average frost-free period is 180 to 200 days.

The unit is 40 percent Clallam gravelly sandy loam and 40 percent Hoypus gravelly sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

The Clallam soil is moderately deep and moderately well drained. It formed in compact glacial till. Typically, the surface is covered with a mat of organic material 2.5 inches thick. The surface layer, where mixed to a depth of 6 inches, is dark brown gravelly sandy loam. The upper part of the subsoil is brown gravelly sandy loam about 4 inches thick, and the lower part is brown very gravelly sandy loam about 18 inches thick. Compact glacial till is at a depth of 28 inches. Depth to compact glacial till ranges from 20 to 40 inches. In some areas of similar included soils, the surface layer is sandy loam or very gravelly sandy loam.

Permeability of the Clallam soil is moderate to the compact glacial till and very slow through it. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. Water is perched above the glacial till from January through April. The effect of the layer of glacial till on use and management is similar to that of a hardpan.

The Hoypus soil is very deep and somewhat excessively drained. It formed in glacial outwash. Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is very dark grayish brown gravelly sandy loam 3 inches thick. The upper 7 inches of the subsoil is dark brown gravelly sandy loam, and the lower 21 inches is dark yellowish brown very gravelly loamy sand. The upper 14 inches of the substratum is dark brown very gravelly sand, and the lower part to a depth of 60 inches or more is dark yellowish brown gravelly sand. In some areas of similar included soils, the surface layer is gravelly loamy sand, very gravelly sandy loam, or gravelly loamy sand.

Permeability of the Hoypus soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

Included in this unit are small areas of Bellingham, Catla, Dick, and McKenna soils. Also included are small areas of Hoypus soils that have slopes of more than 15 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

This unit is used mainly as homesites. It is also used as woodland.

If the Clallam soil is used for homesite development, the main limitation is wetness. Excavation for roads and buildings increases the risk of erosion.

Use of this soil for septic tank absorption fields is limited by wetness and depth to the compact glacial till. Because of the depth to compact glacial till, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Use of heavy equipment during construction compacts the soil and thus reduces permeability, particularly during periods when the soil moisture content is high. The steepness of slope is a concern when installing septic tank absorption fields. Absorption lines should be installed on the contour.

If the Hoypus soil is used for homesite development, the main limitation is the steepness of slope. Preserving the existing plant cover during construction helps to control erosion. Excavation for roads and buildings increases the risk of erosion.

Use of this soil for septic tank absorption fields is limited by the rapid permeability. The soil is a poor filter. The steepness of slope is a concern when installing septic tank absorption fields. Absorption lines should be installed on the contour.

The Clallam soil is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 130, and on the basis of a 50-year site curve, the estimated mean site index is 98. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 70 is 130 cubic feet per acre per year. The trees of limited extent are western hemlock, grand fir, western redcedar, red alder, and Pacific madrone. Among the common forest understory plants are salal, evergreen huckleberry, red huckleberry, Oregon-grape, oceanspray, twinflower, blackberry, western swordfern, and western brackenfern. Floral use of salal, evergreen huckleberry, and western swordfern is common on this soil.

The Clallam soil is suited to year-round harvesting operations. Logging roads require suitable surfacing. Rock for road construction is not available in areas of this soil. Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. The low precipitation during the growing season and low available water capacity contribute to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Because the rooting depth is restricted by the

compact glacial till, trees occasionally are subject to windthrow.

The Hoypus soil is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 134, and on the basis of a 50-year site curve, the estimated mean site index is 101. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 70 is 136 cubic feet per acre per year. The trees of limited extent are western hemlock, western redcedar, bigleaf maple, and Pacific madrone. Among the common forest understory plants are salal, Oregon-grape, red huckleberry, western brackenfern, blackberry, western swordfern, and deer fern. Floral use of salal and western swordfern is common on this soil.

The Hoypus soil is suited to year-round logging operations. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Logging roads require suitable surfacing for year-round use. Rounded gravel for road construction is readily available in areas of this soil.

Seedling establishment is the main concern in the production of timber. The low precipitation during the growing season and the droughtiness of the surface layer contribute to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

This map unit is in capability subclass VIs, nonirrigated.

15—Clallam Variant gravelly loam, 10 to 30 percent slopes. This moderately deep, moderately well drained soil is on hills. It formed in glacial till and volcanic ash overlying compact glacial till. The native vegetation is mainly conifers and shrubs. Elevation is 1,300 to 2,000 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is about 46 degrees F, and the average growing season is 210 to 240 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer, where mixed to a depth of 7 inches, is brown gravelly loam. The upper 8 inches of the subsoil is brown very gravelly loam, and the lower 15 inches is dark yellowish brown very gravelly sandy loam. Compact glacial till is at a depth of 30 inches. Depth to compact glacial till ranges from 20 to 40 inches.

Included in this unit are small areas of Elwha, Louella, and McKenna soils. Also included are small areas of Clallam Variant soils that have slopes of less than 10 percent or more than 30 percent and soils that are more than 40 inches deep to compact glacial till. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Clallam Variant soil is moderate to the compact glacial till and very slow through it. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. Water is perched above the compact glacial till from January through March. The effect of the layer of compact glacial till on use and management is similar to that of a hardpan.

This unit is used as woodland.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 134, and on the basis of a 50-year site curve, the estimated mean site index is 103. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 70 is 136 cubic feet per acre per year. The trees of limited extent are western hemlock, western redcedar, and red alder. Among the common forest understory plants are red huckleberry, twinflower, salal, Oregon-grape, oceanspray, western swordfern, deer fern, and western brackenfern.

The main limitation for harvesting timber is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. A perched seasonal high water table may limit the use of equipment to dry periods. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in areas of this unit.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Because the rooting depth is restricted by the compact glacial till, trees occasionally are subject to windthrow.

This map unit is in capability subclass IVe, nonirrigated

16—Dick loamy sand, 0 to 15 percent slopes. This very deep, somewhat excessively drained soil is on outwash terraces. It formed in glacial outwash. The native vegetation is mainly conifers and shrubs. Elevation is near sea level to 500 feet. The average annual precipitation is 17 to 25 inches, the average annual air temperature is about 50 degrees F, the average frost-free period is 160 to 200 days, and the average growing season (at 28 degrees) is 230 to 260 days.

Typically, the surface is covered with a mat of organic material about 2 inches thick. The surface layer is

grayish brown and dark brown loamy sand about 3 inches thick. The next layer is brown sand about 19 inches thick. The upper 26 inches of the underlying material is light olive brown and yellowish brown, stratified sand to loamy sand, and the lower part to a depth of 60 inches or more is olive brown and dark yellowish brown, stratified gravelly sand to gravelly loamy sand. In some areas of similar included soils, the surface layer is loamy fine sand or fine sandy loam.

Included in this unit are small areas of Agnew, Cassolary, Clallam, and Hoypus soils. Also included are small areas of Dick soils that have slopes that are more than 15 percent. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Dick soil is rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used as woodland, hayland, pastureland, cropland, and homesites.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 144, and on the basis of a 50-year site curve, the estimated mean site index is 110. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 150 cubic feet per acre per year. The trees of limited extent are western hemlock, western redcedar, grand fir, and red alder. Among the common forest understory plants are salal, red huckleberry, elderberry, bedstraw, evergreen huckleberry, oceanspray, Oregon-grape, western swordfern, and western brackenfern. Floral use of salal, evergreen huckleberry, and western swordfern is common on this unit.

The main limitation for harvesting timber is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in areas of this unit.

Seedling establishment is the main concern in the production of timber. The low precipitation during the growing season and low available water capacity contribute to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

If this unit is used for hay and pasture, the main limitations are steepness of slope and droughtiness. Irrigation is required for maximum production. Seedbed preparation should be on the contour or across the slope where practical.

If this unit is used for crops, it is limited mainly by steepness of slope and droughtiness. Crops commonly grown on this unit include small grain, strawberries, raspberries, and truck crops.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Because the unit is droughty, applications of irrigation water should be light and frequent. The organic matter content can be maintained by using all crop residue, plowing under cover crops or green manure crops, and using a suitable rotation. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on the surface helps to conserve moisture, maintain tilth, and control erosion. Limiting tillage for seedbed preparation and weed control reduces runoff and erosion. Tillage should be on the contour or across the slope.

If this unit is used for homesite development, the main limitation is the steepness of slope. Preserving the existing plant cover during construction helps to control erosion. Excavation for roads and buildings increases the risk of erosion. Cutbanks are not stable and are subject to caving in.

Use of the soil in this unit for septic tank absorption fields is limited by the rapid permeability. The soil is a poor filter. The steepness of slope is a concern when installing septic tank absorption fields. Absorption lines should be installed on the contour.

This map unit is in capability subclass IVs, irrigated and nonirrigated.

17—Dungeness silt loam. This very deep, well drained soil is on low terraces and flood plains. It formed in alluvium. The native vegetation is mainly mixed conifers and deciduous trees and shrubs. Slope is 0 to 5 percent. Elevation is 25 to 300 feet. The average annual precipitation is 17 to 25 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is 170 to 200 days.

Typically, the surface layer is very dark grayish brown silt loam 8 inches thick. The upper 34 inches of the substratum is stratified, very dark grayish brown and dark grayish brown silt loam, very fine sandy loam, and silty clay loam. The lower part to a depth of 60 inches or more is stratified, dark grayish brown and olive gray very fine sandy loam, fine sandy loam, fine sand, and medium sand. In some areas of similar included soils, the surface layer is fine sandy loam.

Included in this unit are small areas of Carlsborg, Hoypus, and Puget soils. Also included are small areas

of soils that are moderately well drained. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Dungeness soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight. The soil is subject to rare periods of flooding.

This unit is used as hayland, pastureland, cropland, and homesites.

This unit is well suited to hay and pasture. It has few limitations. Irrigation is required for maximum production. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is well suited to irrigated crops. It has few limitations. Crops commonly grown on this unit include strawberries, raspberries, small grain, and truck crops.

In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Use of equipment when the soil is wet results in compaction, which restricts penetration of moisture and roots. The organic matter content can be maintained by using all crop residue, plowing under cover crops or green manure crops, and using a suitable rotation. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on the surface helps to conserve moisture, maintain tilth, and control erosion.

The unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 152, and on the basis of a 50-year site curve, the estimated mean site index is 115. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 161 cubic feet per acre per year. Red alder is of limited extent in the unit. Among the common forest understory plants are Oregon-grape, salmonberry, western swordfern, and bedstraw.

Seedling establishment is the main concern in the production of timber. Reforestation can be accomplished by planting Douglas-fir seedlings.

The main limitation for harvesting timber is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not available in areas of this unit.

If this unit is used for homesite development, the main limitation is the hazard of flooding. Preserving the existing plant cover during construction helps to control erosion. Excavation for roads and buildings increases the risk of erosion. Cutbanks are not stable and are subject to caving in.

Use of this soil for septic tank absorption fields has few limitations.

Use of heavy equipment when the soil moisture content is high compacts the soil and thus reduces permeability of the soil.

This map unit is in capability class I, irrigated, and subclass IIc, nonirrigated.

18—Dystric Xerorthents, bouldery. These very deep, somewhat excessively drained soils are on hills. They formed in landslide debris derived dominantly from basalt, sandstone, and conglomerate. Slope is 10 to 50 percent. The native vegetation is mainly conifers and shrubs. Elevation is 400 to 800 feet. The average annual precipitation is 55 to 70 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 220 to 260 days.

No single profile of Dystric Xerorthents, bouldery, is typical, but in one commonly observed in the survey area about 1 percent of the surface is covered with boulders. The surface layer is brown extremely cobbly sandy loam 6 inches thick. The substratum to a depth of 60 inches or more is brown extremely bouldery loamy sand. In some areas of similar included soils, the surface layer is extremely gravelly loamy sand. These soils vary widely in texture within short distances.

Included in this unit are small areas of Neilton soils. Also included are small areas of poorly drained soils and Dystric Xerorthents, bouldery, that have slopes of less than 10 percent or more than 50 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Dystric Xerorthents is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate.

Most areas of this unit are used as woodland. A few areas are used as homesites.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 107, and on the basis of a 50-year site curve, the estimated mean site index is 90. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 94 cubic feet per acre per year. The trees of limited extent are western hemlock and western redcedar. Among the common forest understory plants are salal, red huckleberry, Oregon-grape, twinflower, and western brackenfern.

The main limitation for the harvesting of timber is steepness of slope and boulders on the surface. Boulders on the surface hinder harvesting operations. Steepness of slope restricts the use of wheeled and tracked equipment in skidding operations; cable yarding systems generally are safer and disturb the soil less. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Logging roads require suitable surfacing for year-round use. Rock for road construction is readily available in areas of this unit. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment is the main concern in the production of timber. The low precipitation during the growing season and droughtiness of the surface layer cause high mortality of seedlings, especially on south- and southwest-facing slopes. Reforestation can be accomplished by planting Douglas-fir seedlings. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

If this unit is used for homesite development, the main limitations are steepness of slope and boulders on the surface and in the soil. Preserving the existing plant cover during construction helps to control erosion. Excavation for roads and buildings increases the risk of erosion.

Use of the soil in this unit for septic tank absorption fields is limited by slope, the rapid permeability, and the boulders in the soil. The steepness of slope is a concern when installing septic tank absorption fields. Absorption lines should be installed on the contour and be designed so that effluent is evenly distributed throughout the absorption field. The soil is a poor filter.

This map unit is in capability subclass VIIs, nonirrigated.

19—Dystric Xerorthents, extremely steep. These very deep, well drained soils are on coastal bluffs. They formed in colluvium derived dominantly from glacial drift. Slope is 50 to 120 percent. The native vegetation is mainly mixed conifers and deciduous trees and shrubs. Elevation is near sea level to 300 feet. The average annual precipitation is 15 to 40 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 220 to 260 days.

No single profile of Dystric Xerorthents, extremely steep, is typical, but in one commonly observed in the survey area the surface is covered with a mat of organic material 1 inch thick. The surface layer is dark brown gravelly sandy loam 3 inches thick. The substratum to a depth of 60 inches or more is brown gravelly sandy loam. In some areas of similar included soils, the surface layer is sandy loam or loamy sand. These soils vary widely in texture within short distances.

Included in this unit are small areas of soils that are very gravelly throughout. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Dystric Xerorthents is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium to rapid, and the hazard of water erosion is severe.

This unit is used as woodland and wildlife habitat.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 100, and on the basis of a 50-year site curve, the estimated mean site index is 85. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 84 cubic feet per acre per year. The trees of limited extent are western redcedar and western hemlock. Among the common forest understory plants are salal, red huckleberry, Oregon-grape, twinflower, and western brackenfern.

The main limitation for harvesting timber is steepness of slope. Cable yarding systems are suitable for use on this unit. Steep yarding paths and firebreaks are subject to rilling and gullying unless they are protected by vegetation. Logging roads require suitable surfacing for year-round use. Rock for road construction is not available in areas of this unit. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment is the main concern in the production of timber. The low precipitation during the growing season and droughtiness of the surface layer cause high mortality of seedlings. Reforestation can be accomplished by planting Douglas-fir seedlings. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

This map unit is in capability subclass VIIe, nonirrigated.

20—Elwha gravelly sandy loam, 0 to 15 percent slopes. This moderately deep, moderately well drained soil is on hills. It formed in compact glacial till. The native vegetation is mainly conifers and shrubs. Elevation is 200 to 2,000 feet. The average annual precipitation is 30 to 45 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 260 days.

Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark brown gravelly sandy loam 4 inches thick. The subsoil is brown and dark yellowish brown gravelly sandy loam 29 inches thick. Compact glacial till is at a depth of 33 inches.

Depth to compact glacial till ranges from 20 to 40 inches. In some areas of similar included soils, the surface layer is sandy loam, loam, or gravelly loam.

Included in this unit are small areas of Bellingham, Clallam, McKenna, Mukilteo, Neilton, and Schnorbush soils. Also included are small areas of Elwha soils that have slopes of more than 15 percent and soils that are more than 40 inches deep to compact glacial till. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Elwha soil is moderate to the compact glacial till and very slow through it. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. Water is perched above the compact glacial till from January through April. The effect of the layer of compact glacial till on use and management is similar to that of a hardpan.

This unit is used mainly as woodland. It is also used as homesites.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 145, and on the basis of a 50-year site curve, the estimated mean site index is 111. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 152 cubic feet per acre per year. The trees of limited extent are red alder, western hemlock, grand fir, western redcedar, and bigleaf maple. Among the common forest understory plants are salal, oceanspray, western brackenfern, western swordfern, twinflower, and red huckleberry. Floral use of salal and western swordfern is common on this unit.

Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Logging roads require suitable surfacing for year-round use. Rock for road construction is not available in areas of this unit.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. The low available water capacity of the surface layer contributes to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Because the rooting depth is restricted by the compact glacial till, trees occasionally are subject to windthrow.

If this unit is used for homesite development, the main limitation is wetness. Excavation for roads and buildings increases the risk of erosion.

Use of the soil in this unit for septic tank absorption fields is limited by wetness and depth to the compact glacial till. Because of the depth to glacial till, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Use of heavy equipment during construction compacts the soil and thus reduces permeability, particularly during periods when the soil moisture content is high. The steepness of slope is a concern when installing septic tank absorption fields. Absorption lines should be installed on the contour.

This map unit is in capability subclass IVe, nonirrigated.

21—Elwha gravelly sandy loam, 15 to 35 percent slopes. This moderately deep, moderately well drained soil is on hills. It formed in compact glacial till. The native vegetation is mainly conifers and shrubs. Elevation is 200 to 2,000 feet. The average annual precipitation is 30 to 45 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 260 days.

Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark brown gravelly sandy loam 4 inches thick. The subsoil is brown and dark yellowish brown gravelly sandy loam 29 inches thick. Compact glacial till is at a depth of 33 inches. Depth to compact glacial till ranges from 20 to 40 inches. In some areas of similar included soils, the surface layer is sandy loam, loam, or gravelly loam.

Included in this unit are small areas of Clallam, Louella, Neilton, Schnorbush, and Terbies soils. Also included are small areas of Elwha soils that have slopes of less than 15 percent or more than 35 percent and soils that are more than 40 inches deep to compact glacial till. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Elwha soil is moderate to the compact glacial till and very slow through it. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. Water is perched above the compact glacial till from January through April. The effect of the layer of compact glacial till on use and management is similar to that of a hardpan.

Most areas of this unit are used as woodland. A few areas are used as homesites.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 145, and on the basis of a 50-year site curve, the estimated mean site index is 111. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 152 cubic feet per acre per year. The trees of limited extent are red alder, western hemlock, grand fir, western redcedar, and bigleaf maple. Among the common forest understory plants are salal, oceanspray, western brackenfern, western swordfern, twinflower, and red huckleberry. Floral use of salal and western swordfern is common on this unit.

Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Logging roads require suitable surfacing for year-round use. Rock for road construction is not available in areas of this unit. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. The low available water capacity of the surface layer contributes to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Because the rooting depth is restricted by the compact glacial till, trees occasionally are subject to windthrow.

If this unit is used for homesite development, the main limitations are steepness of slope and wetness. Excavation for roads and buildings increases the risk of erosion.

Use of the soil in this unit for septic tank absorption fields is limited by steepness of slope, wetness, and depth to the compact glacial till. Because of the depth to glacial till, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Use of heavy equipment during construction compacts the soil and thus reduces permeability, particularly during periods when the soil moisture content is high. The steepness of slope is a concern when installing septic tank absorption fields. Absorption lines should be installed on the contour.

This map unit is in capability subclass IVe, nonirrigated.

22—Hoh silt loam. This very deep, well drained soil is on low terraces and flood plains. It formed in alluvium. Slope is 0 to 2 percent. The native vegetation is mainly conifers and shrubs. Elevation is near sea level to 500 feet. The average annual precipitation is 90 to 140 inches, the average annual air temperature is about 50 degrees F, the average frost-free period is 160 to 190 days, and the average growing season (at 28 degrees) is 220 to 250 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The upper part of the surface layer is dark grayish brown silt loam 7 inches thick, and the lower part is stratified, dark brown very fine sandy loam and silt loam 14 inches thick. The substratum to a depth of 60 inches or more is dark brown and dark grayish brown, stratified fine sandy loam and loamy sand. In some areas of similar included soils, the surface layer is fine sandy loam.

Included in this unit are small areas of Queets soils and Riverwash. Also included are small areas of soils that are sandy or have a gravelly substratum at a depth of less than 40 inches and poorly drained soils in old river channels. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Hoh soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight. This soil is subject to occasional, brief periods of flooding from December through March.

Most areas of this unit are used as woodland, hayland, and pastureland. A few areas are used as homesites.

This unit is suited to the production of red alder. On the basis of a 50-year site curve, the estimated mean site index is 110. At the culmination of the mean annual increment (CMAI), the production of red alder at age 40 is 135 cubic feet per acre per year. The trees of limited extent are Sitka spruce and bigleaf maple. Among the common forest understory plants are red huckleberry, salmonberry, western swordfern, deer fern, and ladyfern.

The main limitation for harvesting timber is muddiness when the soil is wet. Cable yarding systems can be used to minimize soil damage. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Occasional periods of flooding may limit the use of equipment to dry periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in areas of this unit.

Seedling establishment is the main concern in the production of timber. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Reforestation can be accomplished by planting Sitka spruce seedlings. If seed trees are present, natural reforestation of cutover areas by red alder occurs readily. Mortality of seedlings may be high where flooding occurs.

If this unit is used as hayland and pastureland, the main limitation is the hazard of flooding. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

If this unit is used for homesite development, the main limitation is the hazard of flooding. Roads and streets should be located above the expected flood level. Preserving the existing plant cover during construction helps to control erosion. Excavation for roads and buildings increases the risk of erosion. Cutbanks are not stable and are subject to caving in.

Use of the soil in this unit for septic tank absorption fields is limited by the hazard of flooding.

This map unit is in capability subclass IIIw, nonirrigated.

23—Hoypus gravelly sandy loam, 0 to 15 percent slopes. This very deep, somewhat excessively drained soil is on terraces. It formed in glacial outwash. The native vegetation is mainly conifers and shrubs. Elevation is 50 to 1,000 feet. The average annual precipitation is 18 to 30 inches, the average annual air temperature is about 49 degrees F, and the average growing season (at 28 degrees) is 220 to 260 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is very dark grayish brown gravelly sandy loam 3 inches thick. The upper 7 inches of the subsoil is dark brown gravelly sandy loam, and the lower 21 inches is dark yellowish brown very gravelly loamy sand. The upper 14 inches of the substratum is dark brown very gravelly sand, and the lower part to a depth of 60 inches or more is dark yellowish brown gravelly sand. In some areas of similar included soils, the surface layer is gravelly loamy sand, very gravelly sandy loam, or gravelly loamy fine sand.

Included in this unit are small areas of Dick, Carlsborg, Cassolary, Catla, and Clallam soils. Also included are small areas of Hoypus soils that have slopes of more than 15 percent and soils that have a gravelly sandy loam surface layer more than 10 inches thick. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Hoypus soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly as woodland. It is also used as homesites.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 134, and on the basis of a 50-year site curve, the estimated mean site index is 101. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 70 is 136 cubic feet per acre per year. The trees of limited extent are western hemlock, western redcedar, bigleaf maple, and Pacific madrone. Among the common forest understory plants are salal, Oregon-grape, red huckleberry, western brackenfern, blackberry, western swordfern, and deer fern. Floral use of salal and western swordfern is common on this unit.

This unit is suited to year-round logging operations. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Logging roads require suitable surfacing for year-round use. Rounded gravel for road construction is readily available in areas of this unit.

Seedling establishment is the main concern in the production of timber. The low precipitation during the growing season and the droughtiness of the surface layer contribute to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

If this unit is used for homesite development, the main limitation is steepness of slope. Preserving the existing plant cover during construction helps to control erosion. Excavation for roads and buildings increases the risk of erosion. Cutbanks are not stable and are subject to caving in. The soil in this unit is a poor filter for septic tank absorption fields.

This map unit is in capability subclass VIs, nonirrigated.

24—Hoypus gravelly sandy loam, 15 to 30 percent slopes. This very deep, somewhat excessively drained soil is on terraces. It formed in glacial outwash. The native vegetation is mainly conifers and shrubs. Elevation is 50 to 1,000 feet. The average annual precipitation is 18 to 30 inches, the average annual air temperature is about 49 degrees F, and the average growing season (at 28 degrees) is 220 to 260 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is very dark grayish brown gravelly sandy loam 3 inches thick. The upper 7 inches of the subsoil is dark brown gravelly sandy loam, and the lower 21 inches is dark yellowish brown very gravelly loamy sand. The upper 14 inches of the substratum is dark brown very gravelly sand, and the lower part to a depth of 60 inches or more is dark yellowish brown gravelly sand. In some areas of similar included soils, the surface layer is gravelly loamy sand, very gravelly sandy loam, or gravelly loamy fine sand.

Included in this unit are small areas of Clallam and Dick soils. Also included are small areas of Hoypus soils that have slopes of less than 15 percent or more than 30 percent and soils that have a gravelly sandy loam surface layer more than 10 inches thick. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Hoypus soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate.

This unit is used mainly as woodland. It is also used as homesites.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 134, and on the basis of a 50-year site curve, the estimated mean site index is 101. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 70 is 136 cubic feet per acre per year. The trees of limited extent are western hemlock, western redcedar, bigleaf maple, and Pacific madrone. Among the common forest understory plants are salal, Oregon-grape, red huckleberry, western brackenfern, blackberry, western swordfern, and deer

fern. Floral use of salal and western swordfern is common on this unit.

This unit is suited to year-round logging operations. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Logging roads require suitable surfacing for year-round use. Rounded gravel for road construction is readily available in areas of this unit.

Seedling establishment is the main concern in the production of timber. The low precipitation during the growing season and the droughtiness of the surface layer contribute to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

If this unit is used for homesite development, the main limitation is steepness of slope. Preserving the existing plant cover during construction helps to control erosion. Excavation for roads and buildings increases the risk of erosion. Cutbanks are not stable and are subject to caving in.

Use of the soil in this unit for septic tank absorption fields is limited by steepness of slope and rapid permeability. The soil is a poor filter. The steepness of slope is a concern when installing septic tank absorption fields. Absorption lines should be installed on the contour.

This map unit is in capability subclass VIs, nonirrigated.

25—Hoypus gravelly loamy sand, 30 to 65 percent slopes. This very deep, somewhat excessively drained soil is on terrace escarpments. It formed in glacial outwash. The native vegetation is mainly conifers and shrubs. Elevation is 50 to 1,000 feet. The average annual precipitation is 18 to 30 inches, the average annual air temperature is about 49 degrees F, and the average growing season (at 28 degrees) is 220 to 260 days.

Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark brown gravelly loamy sand 4 inches thick. The subsoil is brown and grayish brown gravelly loamy sand 11 inches thick. The substratum to a depth of 60 inches or more is brown very gravelly sand. In some areas of similar included soils, the surface layer is gravelly sandy loam or very gravelly sandy loam.

Included in this unit are small areas of Dick, Louella, and Schnorbush soils. Also included are small areas of Hoypus soils that have slopes of more than 65 percent. Included areas make up about 40 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Hoypus soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is severe.

This unit is used as woodland.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 134, and on the basis of a 50-year site curve, the estimated mean site index is 101. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 70 is 136 cubic feet per acre per year. Among the trees of limited extent are western hemlock, western redcedar, bigleaf maple, and Pacific madrone. Among the common forest understory plants are salal, Oregon-grape, red huckleberry, western brackenfern, blackberry, western swordfern, and deer fern.

The main limitation for harvesting timber is steepness of slope. Steepness of slope restricts the use of wheeled and tracked equipment in skidding operations; cable yarding systems generally are safer and disturb the soil less. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Logging roads require suitable surfacing for year-round use. Rounded gravel for road construction is readily available in areas of this unit. During the first few years following road construction in combination with harvesting, road failures and landslides are likely to occur. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment is the main concern in the production of timber. The low precipitation during the growing season and the droughtiness of the surface layer contribute to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

This map unit is in capability subclass VIIs, nonirrigated.

26—Hyas gravelly loam, 50 to 80 percent slopes. This very deep, well drained soil is on mountainsides. It formed in residuum and colluvium derived from basalt. The native vegetation is mainly conifers and shrubs. Elevation is 1,600 to 2,500 feet. The average annual precipitation is 100 to 140 inches, the average annual air temperature is about 43 degrees F, and the average growing season (at 28 degrees) is 200 to 230 days.

Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark brown gravelly loam 13 inches thick. The subsoil is dark brown and brown gravelly loam 25 inches thick. The substratum to a depth of 60 inches or more is brown very gravelly loam. In some areas of similar included soils, the surface layer is loam.

Included in this unit are small areas of Makah soils. Also included are small areas of Rock outcrop and small areas of Hyas soils that have slopes of more than 80 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Hyas soil is moderate. Available water capacity is moderately high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is severe.

This unit is used as woodland.

This unit is suited to the production of western hemlock and Pacific silver fir (fig. 5). On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 127, and on the basis of a 50-year site curve, the estimated mean site index is 82. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 194 cubic feet per acre per year. Estimates of the site index and production of Pacific silver fir have not been made. The trees of limited extent are Sitka spruce and western redcedar. Among the common forest understory plants are salal, red huckleberry, and deer fern.

The main limitation for harvesting timber is steepness of slope. Cable yarding systems are suitable for use on this unit. Harvesting systems that lift logs entirely off the ground reduce the disturbance of the protective layer of duff. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable

Figure 5.—Regrowth of Pacific silver fir and western hemlock in burned area of Hyas gravelly loam, 50 to 80 percent slopes.

surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is available in areas of this unit. During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment is the main concern in the production of timber. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Reforestation can be accomplished by planting western hemlock and Pacific silver fir seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock and Pacific silver fir occurs readily. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor.

This map unit is in capability subclass VIIe, nonirrigated.

27—Ilwaco silt loam, 15 to 35 percent slopes. This very deep, well drained soil is on foothills. It formed in highly weathered sandstone and loess. The native vegetation is mainly conifers and shrubs. Elevation is 50 to 1,600 feet. The average annual precipitation is 80 to 120 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark brown silt loam 12 inches thick. The upper 32 inches of the subsoil is dark yellowish brown silt loam, and the lower part to a depth of 60 inches or more is yellowish brown silt loam.

Included in this unit are small areas of Calawah, Klone, Ozette, and Snahopish soils. Also included are small areas of Ilwaco soils that have slopes of more than 35 percent and soils that have a dark colored surface layer less than 10 inches thick. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Ilwaco soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow to medium, and the hazard of water erosion is moderate.

This unit is used as woodland.

This unit is suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 153, and on the basis of a 50-year site curve, the estimated mean site index is 110. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 243 cubic feet per acre per year. The trees of limited extent are red alder and western redcedar. Among the common forest understory plants are salal, Oregon oxalis, western swordfern, western brackenfern, salmonberry, red huckleberry, deer fern, and blackberry.

The main limitation for harvesting timber is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Cable yarding systems can be used to minimize soil damage. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are soft and slippery when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in areas of this unit. During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur.

Seedling establishment is the main concern in the production of timber. If openings are made in the canopy, invading brushy plants can prevent the establishment of seedlings. Reforestation can be accomplished by planting western hemlock seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily. Western hemlock, a shallow rooted tree, commonly is subject to windthrow.

This map unit is in capability subclass IVe, nonirrigated.

28—Ilwaco-Klone complex, 30 to 65 percent slopes. This map unit is on foothills and terrace escarpments. The native vegetation is mainly conifers and shrubs. Elevation is 100 to 800 feet. The average annual precipitation is 90 to 120 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

The unit is 40 percent Ilwaco silt loam and 40 percent Klone very gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

The Ilwaco soil is very deep and well drained. It formed in material weathered from sandstone and loess. Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark brown silt loam 12 inches thick. The upper 32 inches of the subsoil is dark yellowish brown silt loam, and the lower part to a depth of 60 inches or more is yellowish brown silt loam.

Permeability of the Ilwaco soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Klone soil is very deep and well drained. It formed in glacial outwash. Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark brown very gravelly loam 10 inches thick.

The subsoil is dark yellowish brown very gravelly loam 39 inches thick. The substratum to a depth of 60 inches or more is brown extremely gravelly loamy sand. In some areas of similar included soils, the surface layer is gravelly loam, gravelly silt loam, or very gravelly silt loam.

Permeability of the Klone soil is moderate to the substratum and rapid through it. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

Included in this unit are small areas of Ozette and Snahopish soils. Also included are small areas of Ilwaco and Klone soils that have slopes less than 30 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

This unit is used as woodland.

The Ilwaco soil is well suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 153, and on the basis of a 50-year site curve, the estimated mean site index is 110. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 243 cubic feet per acre per year. The trees of limited extent are red alder and western redcedar. Among the common forest understory plants are salal, Oregon oxalis, western swordfern, western brackenfern, salmonberry, red huckleberry, deer fern, and blackberry.

The main limitation for harvesting timber on the Ilwaco soil is steepness of slope. Steepness of slope restricts the use of wheeled and tracked equipment in skidding operations; cable yarding systems generally are safer and disturb the soil less. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Unsurfaced roads and skid trails are soft and slippery when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in areas of this Ilwaco soil. During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment is the main concern in the production of timber on the Ilwaco soil. If openings are made in the canopy, invading brushy plants can prevent the establishment of seedlings. Reforestation can be accomplished by planting western hemlock seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily. Western hemlock, a shallow rooted tree, commonly is subject to windthrow.

The Klone soil is suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 148, and on the basis of a 50-year site curve, the estimated mean site index is 104. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 234 cubic feet per acre per year. The trees of limited extent are Sitka spruce and western redcedar. Among the common forest understory plants are red huckleberry, salmonberry, Oregon oxalis, western swordfern, deer fern, ladyfern, salal, and vine maple.

The main limitation for harvesting timber on the Klone soil is steepness of slope. Steepness of slope restricts the use of wheeled and tracked equipment in skidding operations; cable yarding systems generally are safer and disturb the soil less. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Logging roads require suitable surfacing for year-round use. Rounded gravel for road construction is readily available in areas of the Klone soil. During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Reforestation on the Klone soil can be accomplished by planting western hemlock or Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily.

This map unit is in capability subclass VIIe, nonirrigated.

29—Klone very gravelly loam, 0 to 15 percent slopes. This very deep, well drained soil is on terraces. It formed in glacial outwash. The native vegetation is mainly conifers and shrubs. Elevation is 50 to 1,200 feet. The average annual precipitation is 80 to 130 inches, the average annual air temperature is about 49 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark brown very gravelly loam 10 inches thick. The subsoil is dark yellowish brown very gravelly loam 39 inches thick. The substratum to a depth of 60 inches or more is brown extremely gravelly loamy sand. In some areas of similar included soils, the surface layer is gravelly loam, gravelly silt loam, or very gravelly silt loam.

Included in this unit are small areas of Calawah, Ozette, and Tealwhit soils. Also included are small areas of soils that are less than 35 percent rock fragments and Klone soils that have slopes of more than 15 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Klone soil is moderate to the substratum and rapid through it. Available water capacity

is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight.

This unit is used as woodland.

This unit is suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 157, and on the basis of a 50-year site curve, the estimated mean site index is 112. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 249 cubic feet per acre per year. The trees of limited extent are Sitka spruce and western redcedar. Among the common forest understory plants are red huckleberry, salmonberry, Oregon oxalis, western swordfern, deer fern, ladyfern, salal, and vine maple.

The main limitation for harvesting timber is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Cable yarding systems can be used to minimize soil damage. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rounded gravel for road construction is readily available in areas of this unit.

Reforestation can be accomplished by planting western hemlock or Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily.

This map unit is in capability subclass IVe, nonirrigated.

30—Klone very gravelly loam, 30 to 65 percent slopes. This very deep, well drained soil is on terrace escarpments. It formed in glacial outwash. The native vegetation is mainly conifers and shrubs. Elevation is 50 to 1,200 feet. The average annual precipitation is 80 to 130 inches, the average annual air temperature is about 49 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark brown very gravelly loam 10 inches thick. The subsoil is dark yellowish brown very gravelly loam 39 inches thick. The substratum to a depth of 60 inches or more is brown extremely gravelly loamy sand. In some areas of similar included soils, the surface layer is gravelly loam, gravelly silt loam, or very gravelly silt loam.

Included in this unit are small areas of Calawah, Ozette, and Snahopish soils. Also included are small areas of soils that are gravelly and Klone soils that have slopes of more than 65 percent. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Klone soil is moderate to the substratum and rapid through it. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as woodland.

This unit is suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 148, and on the basis of a 50-year site curve, the estimated mean site index is 104. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 234 cubic feet per acre per year. The trees of limited extent are Sitka spruce and western redcedar. Among the common forest understory plants are red huckleberry, salmonberry, Oregon oxalis, western swordfern, deer fern, ladyfern, salal, and vine maple.

The main limitation for harvesting timber is steepness of slope. Steepness of slope restricts the use of wheeled and tracked equipment in skidding operations; cable yarding systems generally are safer and disturb the soil less. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Logging roads require suitable surfacing for year-round use. Rounded gravel for road construction is readily available in areas of this unit. During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Reforestation can be accomplished by planting western hemlock or Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily.

This map unit is in capability subclass VIIe, nonirrigated.

31—Klone-Ozette-Tealwhit complex, 0 to 15 percent slopes. This map unit is on low terraces and hills. The native vegetation is mainly conifers and shrubs. Elevation is 100 to 800 feet. The average annual precipitation is 80 to 130 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

This unit is 50 percent Klone very gravelly loam, 0 to 15 percent slopes; 20 percent Ozette silt loam, 5 to 15 percent slopes; and 20 percent Tealwhit silt loam, 0 to 5 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

The Klone soil is very deep and well drained. It formed in glacial outwash. Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark brown very gravelly loam 10 inches thick. The subsoil is dark yellowish brown very gravelly loam 39 inches thick. The substratum to a depth of 60 inches or more is brown extremely gravelly loamy sand. In some areas of similar included soils, the surface layer is

gravelly loam, gravelly silt loam, or very gravelly silt loam.

Permeability of the Klone soil is moderate to the substratum and rapid through it. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight.

The Ozette soil is deep and moderately well drained. It formed in loess and glacial till derived mainly from sandstone and siltstone and is underlain by compact glacial till. Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is very dark grayish brown and dark brown silt loam 18 inches thick. The subsoil is dark yellowish brown gravelly loam 24 inches thick. Compact glacial till is at a depth of 42 inches. Depth to compact glacial till ranges from 40 to 60 inches or more. In some areas of similar included soils, the surface layer is gravelly silt loam, gravelly loam, or loam.

Permeability of the Ozette soil is moderate to the compact glacial till and very slow through it. Available water capacity is moderately high. Effective rooting depth is 40 to 60 inches or more. Runoff is medium, and the hazard of water erosion is slight. Water is perched above the compact glacial till from December through March. The effect of the layer of glacial till on use and management is similar to that of a hardpan.

The Tealwhit soil is very deep and poorly drained. It formed in alluvium. Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is very dark grayish brown silt loam 6 inches thick. The subsoil is dark grayish brown and olive silty clay loam 32 inches thick. The substratum to a depth of 60 inches or more is olive very fine sandy loam. In some areas of similar included soils, the surface layer is silty clay loam.

Permeability of the Tealwhit soil is slow. Available water capacity is high. Effective rooting depth is limited by a seasonal high water table that is at a depth of 6 to 12 inches from October through May. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to rare periods of flooding

Included in this unit are small areas of Calawah, Kydaka, and Queets soils. Also included are small areas of Riverwash and small areas of Klone soils that have slopes of more than 15 percent. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

This unit is used as woodland.

The Klone soil is suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 157, and on the basis of a 50-year site curve, the estimated mean site index is 112. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 249 cubic feet per acre per year. The trees of limited extent are Sitka spruce and western redcedar. Among the common forest understory plants are red huckleberry, salmonberry, Oregon oxalis, western swordfern, deer fern, ladyfern, salal, and vine maple.

The main limitation for harvesting timber on the Klone soil is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Cable yarding systems can be used to minimize soil damage. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rounded gravel for road construction is readily available in areas of the Klone soil.

Reforestation on the Klone soil can be accomplished by planting western hemlock or Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily.

The Ozette soil is suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 158, and on the basis of a 50-year site curve, the estimated mean site index is 113. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 251 cubic feet per acre per year. The trees of limited extent are western redcedar, Sitka spruce, and red alder. Among the common forest understory plants are salmonberry, salal, red huckleberry, western swordfern, deer fern, Oregon oxalis, and devilsclub.

The main limitation for harvesting timber on the Ozette soil is muddiness when the soil is wet. Cable yarding systems or low-ground-pressure skidding equipment can be used to minimize soil damage. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are soft and slippery when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in areas of the Ozette soil.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber on the Ozette soil. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Western hemlock is subject to windthrow. Reforestation can be accomplished by planting western hemlock seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily.

The Tealwhit soil is suited to the production of red alder and western redcedar. On the basis of a 50-year site curve, the estimated mean site index for red alder is

90. At the culmination of the mean annual increment (CMAI), the production of red alder at age 40 is 101 cubic feet per acre per year. Estimates of the site index and production of western redcedar have not been made. The trees of limited extent are western hemlock and Sitka spruce. Among the common forest understory plants are salmonberry, salal, red huckleberry, western swordfern, deer fern, and ladyfern.

The main limitation for harvesting timber on the Tealwhit soil is muddiness when the soil is wet. Rare periods of flooding and the seasonal water table limit the use of equipment to dry periods. Cable yarding systems can be used to minimize soil damage. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Helicopters and small tracked vehicles commonly are used for western redcedar salvage operations on this unit. Unsurfaced roads and skid trails are soft and sticky when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in areas of this soil.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber on the Tealwhit soil. The seasonal high water table reduces root respiration, which results in high mortality of seedlings. Reforestation can be accomplished by planting western hemlock, Sitka spruce, or western redcedar seedlings. If seed trees are present, natural reforestation of cutover areas by red alder occurs readily and by western hemlock it occurs periodically. Trees frequently are subject to windthrow when the soil is wet and winds are strong because the seasonal high water table restricts rooting depth. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

This map unit is in capability subclass VIe, nonirrigated.

32—Kydaka silty clay loam. This moderately deep, poorly drained soil is in basins on hills. It formed in loess and glacial drift underlain by dense, compact glacial till. Slope is 0 to 5 percent. The native vegetation is mainly conifers and shrubs. Elevation is 100 to 500 feet. The average annual precipitation is 75 to 95 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 220 to 250 days.

Typically, the surface is covered with a mat of organic material 3.5 inches thick. The surface layer is very dark brown silty clay loam 5 inches thick. The upper 6 inches of the subsoil is very dark grayish brown silty clay loam, and the lower 10 inches is dark grayish brown gravelly clay loam. The substratum is olive gray gravelly loam 9 inches thick. Dense, compact glacial till is at a depth of 30 inches. Depth to compact glacial till ranges from 20 to 40 inches.

Included in this unit are small areas of Ozette and Tealwhit soils. Also included are small areas of soils that are more than 40 inches deep to compact glacial till and soils that are very gravelly. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Kydaka soil is slow to the compact glacial till and very slow through it. Available water capacity is moderately high. Effective rooting depth is limited by a seasonal perched water table that is at the surface to a depth 24 inches below the surface from October through July. Runoff is slow to very slow, and the hazard of water erosion is slight. The effect of the layer of compact glacial till on use and management is similar to that of a hardpan.

This unit is used as woodland.

This unit is suited to the production of western redcedar. On the basis of a 100-year site curve, the estimated mean site index for western redcedar is 108, and on the basis of a 50-year site curve, the estimated mean site index is 70. At the culmination of the mean annual increment (CMAI), the production of western redcedar at age 60 is 156 cubic feet per acre per year. Estimates of the site index and production for western hemlock have not been made. Lodgepole pine is of limited extent in the unit. Among the common forest understory plants are salal, deer fern, red huckleberry, and twinflower.

The main limitation for harvesting timber is muddiness when the soil is wet. The seasonal perched water table limits the use of equipment to dry periods. Cable yarding systems are suitable for use on this unit. When the soil is wet, use of wheeled and tracked equipment for harvesting timber causes excessive rutting. Helicopters and small tracked vehicles commonly are used for western redcedar salvage operations on this unit. Unsurfaced roads and skid trails are soft, sticky, and slippery when wet, and they may be impassable. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in areas of this unit.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. The seasonal perched water table reduces root respiration, which results in high mortality of seedlings. Reforestation can be accomplished by planting western redcedar. If seed trees are present, natural reforestation of cutover areas by western redcedar occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Because the rooting depth is restricted by the perched water table, trees frequently are subject to windthrow.

This map unit is in capability subclass VIw, nonirrigated.

33—Kydaka-Zeeka complex, 0 to 20 percent slopes. This map unit is in depressional areas and on hills. The native vegetation is mainly conifers and shrubs. Elevation is 100 to 500 feet. The average annual precipitation is 80 to 100 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

The unit is 50 percent Kydaka silty clay loam, 0 to 5 percent slopes, and 30 percent Zeeka silty clay loam, 5 to 20 percent slopes The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

The Kydaka soil is moderately deep and poorly drained. It formed in loess and glacial drift that is underlain by dense, compact glacial till. Typically, the surface is covered with a mat of organic material 3.5 inches thick. The surface layer is very dark brown silty clay loam 5 inches thick. The upper 6 inches of the subsoil is very dark grayish brown silty clay loam, and the lower 10 inches is dark grayish brown gravelly clay loam. The substratum is olive gray gravelly clay loam 9 inches thick. Dense, compact glacial till is at a depth of 30 inches. Depth to compact glacial till ranges from 20 to 40 inches.

Permeability of the Kydaka soil is slow to the compact glacial till and very slow through it. Available water capacity is moderately high. Effective rooting depth is limited by a seasonal high water table that is at the surface to a depth of 24 inches below the surface from October through July. Runoff is slow to very slow, and the hazard of water erosion is slight. The effect of the layer of compact glacial till on use and management is similar to that of a hardpan.

The Zeeka soil is moderately deep and somewhat poorly drained. It formed in loess and glacial till over compact glacial till. Typically, the surface is covered with a mat of organic material 6 inches thick. The surface layer is very dark grayish brown and dark grayish brown silt loam 6 inches thick. The subsoil is dark brown, brown, and olive brown silt loam and gravelly silt loam 20 inches thick. Compact glacial till is at a depth of 26 inches. Depth to compact glacial till ranges from 20 to 40 inches. In some areas of similar included soils, the surface layer is silt loam.

Permeability of the Zeeka soil is moderately slow to the compact glacial till and very slow through it. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. Water is perched above the compact glacial till from November through April. The effect of the layer of compact glacial till on use and management is similar to that of a hardpan.

Included in this unit are small areas of Klone, Ozette, and Tealwhit soils. Also included are small areas of organic soils. Included areas make up about 20 percent of the total acreage The percentage varies from one area to another.

This unit is used as woodland.

The Kydaka soil is suited to the production of western redcedar. On the basis of a 100-year site curve, the estimated mean site index for western redcedar is 108, and on the basis of a 50-year site curve, the estimated mean site index is 70. At the culmination of the mean annual increment (CMAI), the production of western redcedar at age 60 is 156 cubic feet per acre per year. Estimates of the site index and production of western hemlock have not been made. Lodgepole pine is of limited extent on the unit. Among the common forest understory plants are salal, deer fern, red huckleberry, and twinflower.

The main limitation for harvesting timber is muddiness when the soil is wet. The perched water table limits the use of equipment to dry periods. Cable yarding systems are suitable for use on this unit. When the soil is wet, use of wheeled and tracked equipment for harvesting timber causes excessive rutting. Helicopters and small tracked vehicles commonly are used for western redcedar salvage operations on this unit. Unsurfaced roads and skid trails are soft, sticky, and slippery when wet, and they may be impassable. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in areas of this unit.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. The seasonal perched water table reduces root respiration, which results in high mortality of seedlings. Reforestation can be accomplished by planting western redcedar seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Because the rooting depth is restricted by the perched water table, trees frequently are subject to windthrow.

The Zeeka soil is suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 123, and on the basis of a 50-year site curve, the estimated mean site index is 90. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 186 cubic feet per acre per year. The trees of limited extent are western redcedar and Pacific silver fir. Among the common forest understory plants are salal, red huckleberry, deer fern, and devilsclub.

The main limitation for harvesting timber is muddiness when the soil is wet. The perched water table limits the use of equipment to dry periods. Cable yarding systems can be used to minimize soil damage. Use of wheeled and tracked equipment when the soil is wet produces

ruts and compacts the soil. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are soft, slippery, and sticky when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in areas of this unit.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Because the rooting depth is restricted by the perched water table, trees frequently are subject to windthrow when the soil is wet and winds are strong. Reforestation can be accomplished by planting western hemlock seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily.

This map unit is in capability subclass VIw, nonirrigated.

34—Louella gravelly loam, 10 to 30 percent slopes. This very deep, well drained soil is on mountainsides. It formed in residuum and colluvium derived from basalt and flow breccia. The native vegetation is mainly conifers and shrubs. Elevation is 200 to 2,000 feet. The average annual precipitation is 30 to 45 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 260 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is dark brown gravelly loam 11 inches thick. The subsoil is dark yellowish brown gravelly clay loam and gravelly loam 36 inches thick. The substratum to a depth of 60 inches or more is dark yellowish brown gravelly sandy loam. In some areas of similar included soils, the surface layer is loam.

Included in this unit are small areas of Clallam, Elwha, Hoypus, Neilton, Schnorbush, and Yeary soils. Also included are small areas of Louella soils that have slopes of more than 30 percent, soils that are very gravelly throughout, and soils that have a dark-colored surface layer less than 10 inches thick. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Louella soil is moderate. Available water capacity is moderately high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight.

This unit is used as woodland.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 122, and on the basis of a 50-year site curve, the estimated mean site index is 93. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 118 cubic feet per acre per year. The trees of limited extent are grand fir, western hemlock, western redcedar, and bigleaf maple. Among the common forest understory plants are salal, creambush oceanspray, red huckleberry, rose, Oregon-grape, and Pacific rhododendron.

The main limitation for harvesting timber is muddiness when the soil is wet. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Unsurfaced roads and skid trails are soft and sticky when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction generally is available in areas of this unit.

Seedling establishment is the main concern in the production of timber. The droughtiness of the surface layer contributes to the mortality of seedlings. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

This map unit is in capability subclass IVe, nonirrigated.

35—Louella gravelly loam, 30 to 65 percent slopes. This very deep, well drained soil is on mountainsides. It formed in residuum and colluvium derived from basalt and flow breccia. The native vegetation is mainly conifers and shrubs. Elevation is 200 to 2,000 feet. The average annual precipitation is 30 to 45 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 260 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is dark brown gravelly loam 11 inches thick. The subsoil is dark yellowish brown gravelly clay loam and gravelly loam 36 inches thick. The substratum to a depth of 60 inches or more is dark yellowish brown gravelly sandy loam. In some areas of similar included soils, the surface layer is loam.

Included in this unit are small areas of Clallam, Elwha, Hoypus, Neilton, Terbies, and Yeary soils. Also included are small areas of Rock outcrop, Louella soils that have slopes of less than 30 percent or more than 65 percent, soils that are very gravelly throughout, and soils that have a dark-colored surface layer less than 10 inches thick. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Louella soil is moderate. Available water capacity is moderately high. Effective rooting

depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as woodland.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 122, and on the basis of a 50-year site curve, the estimated mean site index is 93. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 118 cubic feet per acre per year. The trees of limited extent are grand fir, western hemlock, western redcedar, and bigleaf maple. Among the common forest understory plants are salal, creambush oceanspray, red huckleberry, rose, Oregon-grape, and Pacific rhododendron.

The main limitation for harvesting timber is steepness of slope. Steepness of slope restricts the use of wheeled and tracked equipment in skidding operations; cable yarding systems generally are safer and disturb the soil less. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction generally is available in areas of this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion. Cutbanks may slump when the soil is saturated.

Seedling establishment is the main concern in the production of timber. The droughtiness of the surface layer contributes to the mortality of seedlings, especially on south- and southwest-facing slopes. Reforestation can be accomplished by planting Douglas-fir seedlings. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

This map unit is in capability subclass VIe, nonirrigated.

36—Louella gravelly loam, 65 to 90 percent slopes. This very deep, well drained soil is on mountainsides. It formed in residuum and colluvium derived from basalt and flow breccia. The native vegetation is mainly conifers and shrubs. Elevation is 200 to 2,000 feet. The average annual precipitation is 30 to 45 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 260 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is dark brown gravelly loam 11 inches thick. The subsoil is dark yellowish brown gravelly clay loam and gravelly loam 36 inches thick. The substratum to a depth of 60 inches or more is dark yellowish brown gravelly sandy loam. In some areas of similar included soils, the surface layer is loam.

Included in this unit are small areas of Rock outcrop, soils that are less than 60 inches deep to bedrock, soils that have slopes of less than 65 percent, and soils that are very gravelly throughout. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Louella soil is moderate. Available water capacity is moderately high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is severe.

This unit is used as woodland.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 107, and on the basis of a 50-year site curve, the estimated mean site index is 80. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 94 cubic feet per acre per year. The trees of limited extent are grand fir, western hemlock, western redcedar, and bigleaf maple. Among the common forest understory plants are salal, creambush oceanspray, red huckleberry, rose, Oregon-grape, and Pacific rhododendron.

The main limitation for harvesting timber is steepness of slope. Cable yarding systems are suitable for use on this unit. Harvesting systems that lift logs entirely off the ground reduce the disturbance of the protective layer of duff. Locating roads on this unit requires large cuts and fills that remove land from production. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction generally is available in areas of this unit. Cutbanks may slump when the soil is saturated. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion. During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur.

Seedling establishment is the main concern in the production of timber. The droughtiness of the surface layer contributes to mortality of seedlings, especially on south- and southwest-facing slopes. Reforestation can be accomplished by planting Douglas-fir seedlings. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

This map unit is in capability subclass VIIe, nonirrigated.

37—Louella Variant very gravelly loam, 2 to 15 percent slopes. This very deep, well drained soil is on alluvial fans. It formed in alluvium. The native vegetation is mainly conifers and shrubs. Elevation is 400 to 600 feet. The average annual precipitation is 40 to 45 inches, the average annual air temperature is about 49 degrees F, and the average growing season (at 28 degrees) is 230 to 260 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is dark brown very gravelly loam 5 inches thick. The subsoil to a depth of 60 inches or more is yellowish brown, light olive brown, and olive brown very gravelly loam and very gravelly clay loam. In some areas of similar included soils, the surface layer is gravelly loam.

Included in this unit are small areas of Casey, Mukilteo, Schnorbush, and Terbies soils. Also included are small areas of Louella Variant soils that have slopes of more than 15 percent and soils that are moderately well drained. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Louella Variant soil is moderate. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight.

This unit is used as woodland.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 164, and on the basis of a 50-year site curve, the estimated mean site index is 126. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 174 cubic feet per acre per year. The trees of limited extent are western redcedar, grand fir, western hemlock, red alder, and bigleaf maple. Among the common forest understory plants are red huckleberry, salal, Oregon-grape, twinflower, oceanspray, blackberry, western swordfern, western brackenfern, and trillium.

The main limitation for harvesting timber is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not available in areas of this unit.

Seedling establishment is the main concern in the production of timber. The low precipitation during the growing season and the droughtiness of the surface layer contribute to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

This map unit is in capability subclass IVe, nonirrigated.

38—Lummi silt loam. This very deep, poorly drained soil is on low terraces and flood plains. It formed in marine sediment and alluvium. Slope is 0 to 3 percent. The native vegetation is mainly deciduous trees, mixed conifers, sedges, grasses, and shrubs. Elevation is at sea level to 20 feet. The average annual precipitation is 25 to 30 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is 170 to 200 days.

Typically, the surface layer is very dark grayish brown silt loam 9 inches thick. The upper 14 inches of the subsoil is stratified, dark grayish brown very fine sandy loam to silty clay loam, and the lower 17 inches is stratified, dark greenish gray silt loam to silty clay loam. The substratum to a depth of 60 inches or more is stratified, dark greenish gray silt loam to very fine sandy loam.

Included in this unit are small areas of Dungeness, Mukilteo, and Puget soils. Also included are small areas of Beaches. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Lummi soil is moderate. Available water capacity is high. Effective rooting depth is limited by a seasonal high water table that is at a depth of 6 to 24 inches from October through June. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to rare, brief periods of flooding.

Most areas of this unit are used as hayland and pastureland. A few areas are used as homesites.

If this unit is used for hay and pasture, the main limitation is wetness Wetness limits the choice of plants and the period of cutting or grazing and increases the risk of suffocation from water in the root zone. Excessive water on the surface can be removed by ditches and tile drains if an outlet is available. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

The Lummi soil is suited to the production of red alder. On the basis of a 50-year site curve, the estimated mean site index for red alder is 90 At the culmination of the mean annual increment (CMAI), the production of red alder at age 40 is 101 cubic feet per acre per year. Trees of limited extent are western redcedar, western hemlock, black cottonwood, and willow. Among the common forest understory plants are sedge, spirea, and rose.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. The seasonal high water table reduces root respiration, which results in high mortality of seedlings. Reforestation can be accomplished by planting western redcedar

seedlings. If seed trees are present, natural reforestation of cutover areas by red alder occurs readily. Invading brushy plants and grasses can prevent seedling establishment. Because the rooting depth is restricted by the seasonal high water table, trees frequently are subject to windthrow when the soil is wet and the winds are strong.

The main limitation for harvesting timber is muddiness when the soil is wet. The seasonal high water table limits the use of equipment to dry periods. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in areas of this unit.

This unit is poorly suited to homesite development. The main limitations are wetness and the hazard of flooding. Drainage is needed if roads and buildings are constructed. Excavation for roads and buildings increases the risk of erosion. Cutbanks are not stable and are subject to caving in. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Use of the soil for septic tank absorption fields is limited by wetness. The soil is not suited to conventional septic tank absorption fields. Septic tank absorption fields do not function properly during rainy periods. Use of heavy equipment during construction compacts the soil and thus reduces permeability, particularly during periods when the soil moisture content is high.

This map unit is in capability subclass Vw, nonirrigated.

39—Lyre very gravelly sandy loam, 0 to 15 percent slopes. This very deep, somewhat excessively drained soil is on terraces. It formed in glacial outwash. The native vegetation is mainly conifers and shrubs. Elevation is 50 to 800 feet. The average annual precipitation is 60 to 90 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 220 to 250 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is dark brown very gravelly sandy loam 5 inches thick. The subsoil is strong brown and dark yellowish brown very gravelly sandy loam 25 inches thick. The substratum to a depth of 60 inches or more is dark yellowish brown extremely gravelly sand. In some areas of similar included soils, the surface layer is very gravelly loam or very gravelly loamy sand.

Included in this unit are small areas of Bellingham, Mukilteo, and Sadie soils. Also included are small areas of Lyre soils that have slopes of more than 15 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Lyre soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight.

This unit is used as woodland.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 152, and on the basis of a 50-year site curve, the estimated mean site index is 119. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 161 cubic feet per acre per year. Western hemlock is of limited extent in the unit. Among the common forest understory plants are twinflower, salmonberry, elderberry, red huckleberry, salal, western swordfern, bedstraw, ladyfern, and deer fern.

This unit is suited to year-round logging operations. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Logging roads require suitable surfacing for year-round use. Rounded gravel for road construction is readily available in areas of this unit.

Seedling establishment is the main concern in the production of timber. The droughtiness of the surface layer contributes to seedling mortality. Reforestation can be accomplished by planting Douglas-fir or western hemlock seedlings. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

This map unit is in capability subclass IVe, nonirrigated.

40—Lyre very gravelly sandy loam, 15 to 30 percent slopes. This very deep, somewhat excessively drained soil is on terraces. It formed in glacial outwash. The native vegetation is mainly conifers and shrubs. Elevation is 50 to 800 feet. The average annual precipitation is 60 to 90 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 220 to 250 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is dark brown very gravelly sandy loam 5 inches thick. The subsoil is strong brown and dark yellowish brown very gravelly sandy loam 25 inches thick. The substratum to a depth of 60 inches or more is dark yellowish brown extremely gravelly sand. In some areas of similar included soils, the surface layer is very gravelly loam or very gravelly loamy sand.

Included in this unit are small areas of Palix and Sadie soils. Also included are small areas of Lyre soils that have slopes of less than 15 percent or more than 30 percent. Included areas make up about 20 percent of the

total acreage. The percentage varies from one area to another.

Permeability of this Lyre soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as woodland.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 152, and on the basis of a 50-year site curve, the estimated mean site index is 119. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 161 cubic feet per acre per year. Western hemlock is of limited extent in the unit. Among the common forest understory plants are twinflower, salmonberry, elderberry, red huckleberry, salal, western swordfern, bedstraw, ladyfern, and deer fern.

This unit is suited to year-round logging operations. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Logging roads require suitable surfacing for year-round use. Rounded gravel for road construction is readily available in areas of this unit.

Seedling establishment is the main concern in the production of timber. The droughtiness of the surface layer contributes to seedling mortality. Reforestation can be accomplished by planting Douglas-fir or western hemlock seedlings. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

This map unit is in capability subclass IVe, nonirrigated.

41—Makah gravelly loam, 50 to 80 percent slopes. This very deep, well drained soil is on mountainsides. It formed in residuum and colluvium derived from basalt. The native vegetation is mainly conifers and shrubs. Elevation is 400 to 1,800 feet. The average annual precipitation is 90 to 140 inches, the average annual air temperature is about 47 degrees F, and the average growing season (at 28 degrees) is 210 to 240 days.

Typically, the surface is covered with a mat of organic material 3 inches thick. The surface layer is dark brown gravelly loam 14 inches thick. The subsoil is brown and strong brown gravelly loam 31 inches thick. The substratum to a depth of 60 inches or more is dark yellowish brown very gravelly loam. In some areas of similar included soils, the surface layer is loam.

Included in this unit are small areas of Hyas, Ozette, Palix, and Snahopish soils. Also included are small areas of soils that are more than 35 percent hard basalt fragments, Makah soils that have slopes of less than 50 percent or more than 80 percent, and Rock outcrop. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Makah soil is moderate. Available water capacity is moderately high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is severe.

This unit is used as woodland.

This unit is suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 111, and on the basis of a 50-year site curve, the estimated mean site index is 96. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 162 cubic feet per acre per year. The trees of limited extent are Sitka spruce, Pacific silver fir, and western redcedar. Among the common forest understory plants are salal, red huckleberry, deer fern, and western swordfern.

The main limitation for the harvesting of timber is steepness of slope. Cable yarding systems are suitable for use on this unit. Harvesting systems that lift logs entirely off the ground reduce the disturbance of the protective layer of duff. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Unsurfaced roads and skid trails are soft and slippery when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is available in areas of this unit. During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment is the main concern in the production of timber. When openings are made in the canopy, invading brushy plants can prevent the establishment of seedlings. Reforestation can be accomplished by planting western hemlock or Douglas-fir seedlings. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily.

This map unit is in capability subclass VIIe, nonirrigated.

42—McKenna gravelly silt loam. This moderately deep, poorly drained soil is in basins and drainageways. It formed in glacial drift. Slope is 0 to 5 percent. The native vegetation is mainly mixed conifers, deciduous trees, shrubs, grasses, and sedges. Elevation is 50 to 1,000 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is about 50 degrees F, and the average frost-free period is 150 to 180 days.

Typically, the surface layer is very dark gray gravelly silt loam 8 inches thick. The upper part of the subsoil is grayish brown gravelly loam 10 inches thick, and the lower part is light olive gray and olive gray very gravelly loam and very gravelly sandy loam 14 inches thick. Compact glacial till is at a depth of 32 inches. Depth to compact glacial till ranges from 20 to 40 inches. In some areas of similar included soils, the surface layer is silt loam.

Included in this unit are small areas of Bellingham, Clallam, Dick, Elwha, Hoypus, and Mukilteo soils. Also included are small areas of McKenna soils that have slopes of more than 5 percent and soils that are more than 40 inches deep to compact glacial till. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this McKenna soil is slow to the compact glacial till and very slow through it. Available water capacity is moderate. Effective rooting depth is limited by a seasonal perched water table that is at or near the surface to a depth of 6 inches below the surface from November through April. Runoff is ponded, and the hazard of water erosion is slight. The effect of the layer of compact glacial till on use and management is similar to that of a hardpan.

This unit is used as pastureland and woodland.

If this unit is used for pasture, the main limitation is wetness. Wetness limits the choice of plants and the period of grazing and increases the risk of suffocation from water in the root zone. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Use of equipment when the soil is wet results in compaction, which restricts penetration of moisture and roots.

The McKenna soil is suited to the production of red alder. On the basis of a 50-year site curve, the estimated mean site index for red alder is 90. At the culmination of the mean annual increment (CMAI), the production of red alder at age 40 is 101 cubic feet per acre per year. Trees of limited extent are western redcedar and western hemlock. Among the common forest understory plants are red huckleberry, Oregon-grape, vine maple, western swordfern, and bedstraw.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. The seasonal perched high water table reduces root respiration, which results in high mortality of seedlings. Reforestation can be accomplished by planting western redcedar seedlings. If seed trees are present, natural reforestation of cutover areas by red alder occurs readily. When openings are made in the canopy, invading brushy plants can prevent the establishment of seedlings. Because the rooting depth is restricted by the seasonal perched water table, trees are frequently subject to windthrow.

The main limitation for harvesting timber is muddiness when the soil is wet. The seasonal perched water table limits the use of equipment to dry periods. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not available in areas of this unit.

This map unit is in capability subclass VIw, nonirrigated.

43—Mukilteo muck. This very deep, very poorly drained soil is in basins on terraces and in valleys. It formed in organic material. Slope is 0 to 1 percent. The native vegetation is mainly deciduous trees, shrubs, and sedges. Elevation is near sea level to 500 feet. The average annual precipitation is 40 to 70 inches, the average annual air temperature is about 50 degrees F, and the average frost-free period is 160 to 200 days.

Typically, the surface layer is black, partially decomposed organic material 10 inches thick. The underlying material to a depth of 60 inches or more is dark reddish brown and black, partially decomposed organic material.

Included in this unit are small areas of Bellingham soils. Also included are small areas of organic soils that are underlain by glacial till or have thin strata of mineral material. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Mukilteo soil is moderate. Available water capacity is high. Effective rooting depth is limited by a seasonal high water table that is at or near the surface from October through May. Runoff is ponded, and the hazard of water erosion is slight.

This unit is used for wildlife habitat and as woodland.

This unit is suited to the production of red alder. On the basis of a 50-year site curve, the estimated mean site index for red alder is 87. At the culmination of the mean annual increment (CMAI), the production of red alder at age 40 is 96 cubic feet per acre per year. Trees of limited extent are western redcedar and western hemlock. Among the common forest understory plants are trailing blackberry, red elderberry, trillium, devilsclub, and Siberian minerslettuce.

The main limitation for harvesting timber is muddiness when the soil is wet. The seasonal high water table severely limits the use of wheeled and tracked equipment. Cable yarding systems that lift logs entirely off the ground reduce soil damage.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. The seasonal high water table reduces root respiration, which results in high mortality of seedlings. Reforestation can be accomplished by planting western redcedar seedlings. If seed trees are present, natural reforestation of cutover areas by red alder occurs periodically. When openings are made in the canopy, invading brushy plants

can prevent the establishment of seedlings. Because the rooting depth is restricted by the seasonal high water table, trees frequently are subject to windthrow when the soil is wet and winds are strong.

This map unit is in capability subclass Vw, nonirrigated.

44—Neilton very gravelly loamy sand, 30 to 70 percent slopes. This very deep, excessively drained soil is on terrace escarpments. It formed in glacial outwash. The native vegetation is mainly conifers and shrubs. Elevation is near sea level to 1,600 feet. The average annual precipitation is 30 to 60 inches, the average annual air temperature is about 50 degrees F, and the average growing season (at 28 degrees) is 220 to 260 days.

Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark grayish brown very gravelly loamy sand 4 inches thick. The subsoil is dark yellowish brown very gravelly loamy sand 19 inches thick. The upper 31 inches of the substratum is yellowish brown very gravelly loamy sand, and the lower part to a depth of 60 inches or more is yellowish brown extremely gravelly sand. In some areas of similar included soils, the surface layer is very gravelly sandy loam or gravelly loamy sand.

Included in this unit are small areas of Elwha, Schnorbush, and Terbies soils. Also included are small areas of soils that are sandy and soils that have a very gravelly sandy loam surface layer more than 10 inches thick. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Neilton soil is very rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is severe.

This unit is used as woodland.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 141, and on the basis of a 50-year site curve, the estimated mean site index is 105. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 65 is 146 cubic feet per acre per year. The trees of limited extent are grand fir, western hemlock, and western redcedar. Among the common forest understory plants are Oregon-grape, western brackenfern, salal, western swordfern, blackberry, red huckleberry, oceanspray, and twinflower.

The main limitation for harvesting timber is steepness of slope. Steepness of slope restricts the use of wheeled and tracked equipment in skidding operations; cable yarding systems generally are safer and disturb the soil less. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Logging roads require suitable surfacing for year-round use. Rounded gravel for road construction is readily available in areas of this unit. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion. During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur.

Seedling establishment is the main concern in the production of timber. The droughtiness of the surface layer contributes to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

This map unit is in capability subclass VIIs, nonirrigated.

45—Neilton very gravelly sandy loam, 5 to 30 percent slopes. This very deep, excessively drained soil is on terraces. It formed in glacial outwash. The native vegetation is mainly conifers and shrubs. Elevation is near sea level to 1,600 feet. The average annual precipitation is 30 to 60 inches, the average annual air temperature is about 50 degrees F, the average frost-free period is 160 to 200 days, and the average growing season (at 28 degrees) is 220 to 260 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is dark brown very gravelly sandy loam 6 inches thick. The subsoil is dark yellowish brown very gravelly loamy sand 13 inches thick. The substratum to a depth of 60 inches or more is olive brown extremely gravelly sand. In some areas of similar included soils, the surface layer is very cobbly sandy loam or very gravelly loamy sand.

Included in this unit are small areas of Elwha, McKenna, and Schnorbush soils. Also included are small areas of soils that are sandy, soils that have a very gravelly sandy loam surface layer more than 10 inches thick, and Neilton soils that have slopes of less than 5 percent. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Neilton soil is very rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate.

This unit is used mainly as woodland. It is also used as hayland, pastureland, and homesites.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 141, and on the basis of a 50-year site curve, the estimated mean site index is 105. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 65 is 146 cubic feet per acre per year. The trees of limited extent are grand fir, western hemlock, and western redcedar. Among the common forest understory plants are Oregon-grape, western brackenfern, salal, western swordfern,

blackberry, red huckleberry, creambush oceanspray, and twinflower. Floral use of salal and western swordfern is common on this unit.

This unit is suited to year-round logging. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Logging roads require suitable surfacing for year-round use. Rounded gravel for road construction is readily available in areas of this unit.

Seedling establishment is the main concern in the production of timber. The droughtiness of the surface layer contributes to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

If this unit is used for hay and pasture, the main limitations are droughtiness and slope. Irrigation is required for maximum production.

If this unit is used for homesite development, the main limitation is steepness of slope. Preserving the existing plant cover during construction helps to control erosion. Excavation for roads and buildings increases the risk of erosion. Cutbanks are not stable and are subject to caving in.

Use of the soil in this unit for septic tank absorption fields is limited by steepness of slope and the very rapid permeability. The steepness of slope is a concern when installing septic tank absorption fields. Absorption lines should be installed on the contour. The soil is a poor filter.

This map unit is in capability subclass VIs, nonirrigated.

46—Neilton very cobbly sandy loam, 0 to 5 percent slopes. This very deep, excessively drained soil is on terraces. It formed in glacial outwash. The native vegetation is mainly conifers and shrubs. Elevation is near sea level to 1,600 feet. The average annual precipitation is 30 to 60 inches, the average annual air temperature is about 50 degrees F, the average frost-free period is 160 to 200 days, and the average growing season (at 28 degrees) is 220 to 260 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is dark brown very cobbly sandy loam 6 inches thick. The subsoil is dark yellowish brown extremely cobbly sand 10 inches thick. The substratum to a depth of 60 inches or more is dark yellowish brown and olive brown extremely cobbly sand. In some areas of similar included soils, the surface layer is very cobbly loamy sand, very gravelly loamy sand, or very gravelly sandy loam.

Included in this unit are small areas of Elwha, McKenna, and Schnorbush soils. Also included are small areas of soils that are sandy, soils that have a very gravelly sandy loam surface layer more than 10 inches thick, and Neilton soils that have slopes of more than 5 percent. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Neilton soil is very rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly as woodland. It is also used as hayland, pastureland, and homesites.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 104, and on the basis of a 50-year site curve, the estimated mean site index is 79. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 89 cubic feet per acre per year. The trees of limited extent are grand fir, western hemlock, and western redcedar. Among the common forest understory plants are Oregon-grape, western brackenfern, salal, western swordfern, blackberry, red huckleberry, creambush oceanspray, and twinflower. Floral use of salal and western swordfern is common on this unit.

This unit is suited to year-round logging operations. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Logging roads require suitable surfacing for year-round use. Rounded gravel and cobbles for road construction are readily available in areas of this unit.

Seedling establishment is the main concern in the production of timber. The droughtiness of the surface layer contributes to seedling mortality. Reforestation can be accomplished by planting Douglas-fir seedlings. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

If this unit is used for hay and pasture, the main limitations are droughtiness and cobbles on the surface. Irrigation is required for maximum production.

This unit is suited to homesite development. The main limitation is large stones in the soil. Preserving the existing plant cover during construction helps to control erosion. Excavation for roads and buildings increases the risk of erosion. Cutbanks are not stable and are subject to caving in. The soil in this unit is a poor filter because of the very rapid permeability.

This map unit is in capability subclass VIs, nonirrigated.

47—Ozette silt loam, 5 to 35 percent slopes. This deep, moderately well drained soil is on hills. It formed in loess and glacial till derived mainly from sandstone and siltstone and is underlain by compact glacial till. The native vegetation is mainly conifers and shrubs. Elevation is 100 to 1,800 feet. The average annual precipitation is 80 to 120 inches, the average annual air

temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is very dark grayish brown and dark brown silt loam 18 inches thick. The subsoil is dark yellowish brown gravelly loam 24 inches thick. Compact glacial till is at a depth of 42 inches. Depth to compact glacial till ranges from 40 to 60 inches or more. In some areas the surface layer is gravelly silt loam, gravelly loam, or loam.

Included in this unit are small areas of Calawah, Klone, Kydaka, Snahopish, and Tealwhit soils. Also included are small areas of soils that are less than 40 inches deep to compact glacial till and soils that have a dark-colored surface layer less than 10 inches thick. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Ozette soil is moderate to the compact glacial till and very slow through it. Available water capacity is moderately high. Effective rooting depth is 40 to 60 inches or more. Runoff is medium, and the hazard of water erosion is slight. Water is perched above the compact glacial till from December through March. The effect of the layer of compact glacial till on use and management is similar to that of a hardpan.

This unit is used as woodland.

This unit is suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 158, and on the basis of a 50-year site curve, the estimated mean site index is 113. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 251 cubic feet per acre per year. The trees of limited extent are western redcedar, Sitka spruce, and red alder. Among the common forest understory plants are salmonberry, salal, red huckleberry, western swordfern, deer fern, Oregon oxalis, and devilsclub.

The main limitation for harvesting timber is muddiness when the soil is wet. Cable yarding systems can be used to minimize soil damage. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are soft and slippery when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not readily available in areas of this unit. Road construction is easier during dry periods in summer.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Western hemlock commonly is subject to windthrow. Reforestation can be accomplished by planting western hemlock seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily.

This map unit is in capability subclass IVe, nonirrigated.

48—Ozette-Andeptic Udorthents complex, 5 to 80 percent slopes. This map unit is on hills. The native vegetation is mainly conifers and shrubs. Elevation is 100 to 1,400 feet. The average annual precipitation is 80 to 120 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

This unit is 50 percent Ozette silt loam, 5 to 35 percent slopes, and 30 percent Andeptic Udorthents, 50 to 80 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

The Ozette soil is deep and moderately well drained. It formed in loess and glacial till derived mainly from sandstone and siltstone and is underlain by compact glacial till. Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is very dark grayish brown and dark brown silt loam 18 inches thick. The subsoil is dark yellowish brown gravelly loam 24 inches thick. Compact glacial till is at a depth of 42 inches. Depth to compact glacial till ranges from 40 to 60 inches or more. In some areas of similar included soils, the surface layer is gravelly silt loam, gravelly loam, or loam.

Permeability of the Ozette soil is moderate to the compact glacial till and very slow through it. Available water capacity is moderately high. Effective rooting depth is 40 to 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. Water is perched above the compact glacial till from December through March. The effect of the layer of compact glacial till on use and management is similar to that of a hardpan.

The Andeptic Udorthents are very deep and well drained. They formed in glacial till and outwash derived dominantly from sandstone, siltstone, and basalt. No single profile is typical of Andeptic Udorthents, but one commonly observed in the survey area has a surface that is covered with a mat of organic material 2 inches thick. The surface layer is dark brown gravelly silt loam 7 inches thick. The substratum to a depth of 60 inches or more is yellowish brown and olive brown very gravelly sandy loam and very gravelly loamy sand. These soils vary widely in texture within short distances.

Permeability of the Andeptic Udorthents is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is severe.

Included in this unit are small areas of Klone, Makah, Palix, and Snahopish soils. Also included are small areas of soils that have compact glacial till at varying depths and Tealwhit soils along stream bottoms. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

This unit is used as woodland.

The Ozette soil is suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 158, and on the basis of a 50-year site curve, the estimated mean site index is 113. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 251 cubic feet per acre per year. The trees of limited extent are western redcedar, Sitka spruce, and red alder. Among the common understory plants are salmonberry, salal, red huckleberry, western swordfern, deer fern, Oregon oxalis, and devilsclub.

The main limitation for harvesting timber on the Ozette soil is muddiness when the soil is wet. Cable yarding systems can be used to minimize soil damage. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are soft and slippery when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in areas of this unit.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber on the Ozette soil. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Western hemlock commonly is subject to windthrow. Reforestation can be accomplished by planting western hemlock or Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily.

The Andeptic Udorthents are suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 135, and on the basis of a 50-year site curve, the estimated mean site index is 105. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 209 cubic feet per acre per year. The trees of limited extent are Sitka spruce and western redcedar. Among the common forest understory plants are red huckleberry, salmonberry, western swordfern, deer fern, salal, and vine maple.

The main limitation for harvesting timber is steepness of slope. Steepness of slope restricts the use of wheeled and tracked equipment in skidding operations; cable yarding systems generally are safer and disturb the soil less. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Harvesting systems that lift logs entirely off the ground reduce the disturbance of the protective layer of duff. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is available in areas of this unit. During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment is the main concern in the production of timber. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Reforestation can be accomplished by planting western hemlock or Sitka spruce seedlings. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily.

This map unit is in capability subclass VIIe, nonirrigated.

49—Palix loam, 30 to 65 percent slopes. This deep, well drained soil is on foothills. It formed in material weathered from siltstone and very fine sandstone. The native vegetation is mainly conifers and shrubs. Elevation is near sea level to 1,300 feet. The average annual precipitation is 70 to 120 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark brown loam 17 inches thick. The subsoil is dark yellowish brown silty clay loam 16 inches thick. The substratum is dark yellowish brown clay loam 11 inches thick. Fractured, soft siltstone is at a depth of 44 inches. Depth to siltstone ranges from 40 to 60 inches or more. In some areas of similar included soils, the surface layer is silt loam.

Included in this unit are small areas of Ozette and Snahopish soils. Also included are small areas of soils that are less than 40 inches deep to fractured, soft siltstone; Palix soils that have slopes of less than 30 percent or more than 65 percent; and soils that have a dark-colored surface layer less than 10 inches thick. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Palix soil is moderate. Available water capacity is high. Effective rooting depth is 40 to 60 inches or more. Runoff is medium, and the hazard of water erosion is severe.

This unit is used as woodland.

This unit is suited to the production of western hemlock and Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 160, and on the basis of a 50-year site curve, the estimated mean site index is 112. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 254 cubic feet per acre per year. Estimates of the site index and production of Douglas-fir have not been made. Areas on ridgetops that are subject to strong, persistent winds are less productive than other areas of this unit. The trees of limited extent are Douglas-fir, Sitka spruce, and western redcedar. Among the common forest understory plants are salal, Oregon oxalis, western swordfern, western brackenfern, salmonberry, blackberry, red huckleberry, and vine maple

The main limitation for harvesting timber is steepness of slope Steepness of slope restricts the use of wheeled and tracked equipment in skidding operations; cable yarding systems generally are safer and disturb the soil less. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Unsurfaced roads and skid trails are soft and slippery when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in areas of this unit During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur. Cutbanks may slump when the soil is saturated. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment is the main concern in the production of timber. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Reforestation can be accomplished by planting Douglas-fir or western hemlock seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily.

This map unit is in capability subclass VIIe, nonirrigated.

50—Palix loam, 65 to 90 percent slopes. This deep, well drained soil is on foothills. It formed in material weathered from siltstone and very fine sandstone. The native vegetation is mainly conifers and shrubs. Elevation is near sea level to 1,300 feet. The average annual precipitation is 70 to 120 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark brown loam 17 inches thick. The subsoil is dark yellowish brown silty clay loam 16 inches thick. The substratum is dark yellowish brown clay loam 11 inches thick. Fractured, soft siltstone is at a depth of 44 inches. Depth to siltstone ranges from 40 to 60 inches or more. In some areas of similar included soils, the surface layer is silt loam.

Included in this unit are small areas of Snahopish and Solleks soils. Also included are small areas of soils that are less than 40 inches deep to fractured, soft siltstone; Palix soils that have slopes of less than 65 percent; and soils that have a dark-colored surface layer less than 10 inches thick. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Palix soil is moderate. Available water capacity is high. Effective rooting depth is 40 to 60 inches or more. Runoff is medium, and the hazard of water erosion is severe.

This unit is used as woodland.

This unit is suited to the production of western hemlock and Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 160, and on the basis of a 50-year site curve, the estimated mean site index is 112. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 254 cubic feet per acre per year. Estimates of the site index and production of Douglas-fir have not been made. The trees of limited extent are Douglas-fir, Sitka spruce, and western redcedar. Among the common forest understory plants are salal, Oregon oxalis, western swordfern, western brackenfern, salmonberry, blackberry, red huckleberry, and vine maple.

The main limitation for harvesting timber is steepness of slope. Cable yarding systems are suitable for use on this unit. Harvesting systems that lift logs entirely off the ground reduce the disturbance of the protective layer of duff. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in areas of this unit. During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur. Cutbanks may slump when the soil is saturated. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment is the main concern in the production of timber. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Reforestation can be accomplished by planting Douglas-fir or western hemlock seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily.

This map unit is in capability subclass VIIe, nonirrigated.

51—Palix loam, cool, 65 to 90 percent slopes. This deep, well drained soil is on foothills. It formed in material weathered from siltstone and very fine sandstone. The native vegetation is mainly conifers and shrubs. Elevation is near sea level to 1,800 feet. The average annual precipitation is 70 to 120 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 230 days. Persistent cool winds are common on this unit.

Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark brown loam 17 inches thick. The subsoil is dark yellowish brown silty clay loam 16 inches thick. The substratum is dark yellowish brown clay loam 11 inches thick. Fractured, soft siltstone is at a depth of about 44 inches. Depth to siltstone ranges from 40 to 60 inches or more. In some areas of similar included soils, the surface layer is silt loam.

Included in this unit are small areas of Snahopish and Solleks soils. Also included are small areas of soils that are less than 40 inches deep to fractured, soft siltstone; cool Palix soils that have slopes of less than 65 percent; and soils that have a dark-colored surface layer less than 10 inches thick. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Palix soil is moderate. Available water capacity is high. Effective rooting depth is 40 to 60 inches or more. Runoff is medium, and the hazard of water erosion is severe.

This unit is used as woodland.

This unit is suited to the production of western hemlock and Sitka spruce. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 147, and on the basis of a 50-year site curve, the estimated mean site index is 105. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 232 cubic feet per acre per year. Persistent cool winds limit yield on this unit. Estimates of the site index and production of Sitka spruce have not been made. The trees of limited extent are western redcedar, red alder, and Pacific silver fir. Among the common forest understory plants are salal, Oregon oxalis, western swordfern, western brackenfern, salmonberry, blackberry, red huckleberry, and vine maple.

The main limitation for harvesting timber is steepness of slope. Cable yarding systems are suitable for use on this unit. Harvesting systems that lift logs entirely off the ground reduce the disturbance of the protective layer of duff. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not readily available in areas of this unit. During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur. Cutbanks may slump when the soil is saturated. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment is the main concern in the production of timber. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Reforestation can be accomplished by planting Douglas-fir or western hemlock seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily.

This map unit is in capability subclass VIIe, nonirrigated.

52—Pits. Pits is open excavations from which soil material, material such as sand and gravel, and bedrock have been removed. Areas of this unit support little, if any, vegetation.

This unit is used mainly as a source of roadfill for surfacing roads and as a source of sand and gravel for concrete.

This map unit is in capability subclass VIIIs, nonirrigated.

53—Puget silt loam. This very deep, poorly drained soil is on low terraces and flood plains. It has been artificially drained. The soil formed in recent alluvium. Slope is 0 to 3 percent. The native vegetation is mainly mixed conifers, deciduous trees, grasses, shrubs, and sedges. Elevation is 10 to 400 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is about 50 degrees F, and the average frost-free period is 170 to 200 days.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The substratum to a depth of 60 inches or more is grayish brown silty clay loam. In some areas of similar included soils, the surface layer is silty clay loam or loam.

Included in this unit are small areas of Agnew, Carlsborg, Cassolary, Dungeness, Lummi, and Mukilteo soils. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Puget soil is moderately slow. Available water capacity is high. Effective rooting depth is limited by a seasonal high water table that is at a depth of 4 to 6 feet from November through April. Runoff is medium, and the hazard of water erosion is slight. This soil is subject to occasional flooding for brief periods from December through March.

This unit is used mainly as hayland, pastureland, and cropland. It is also used as homesites and woodland.

This unit is suited to hay and pasture. The main limitation is the hazard of flooding. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is well suited to irrigated crops. The main limitation is the hazard of flooding. The main crop is small grain. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Because of the moderately slow permeability of the soil, the application of water should be regulated so that water does not stand on the surface and damage the crops. Use of equipment when the soil is wet results in compaction, which restricts penetration of moisture and roots. The organic matter content can be maintained by using all crop residue, plowing under green manure crops, and using a suitable rotation. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.

This unit is suited to the production of red alder. On the basis of a 50-year site curve, the estimated mean site index for red alder is 90. At the culmination of the mean annual increment (CMAI), the production of red alder at age 40 is 101 cubic feet per acre per year. Trees of limited extent are black cottonwood, western redcedar, and willow. Among the common forest understory plants are trailing blackberry, salmonberry, Oregon-grape, western swordfern, and Indian plum.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. Reforestation can be accomplished by planting western redcedar seedlings. If seed trees are present, natural reforestation of cutover areas by red alder occurs readily. When openings are made in the canopy, invading brushy plants can prevent the establishment of seedlings. Because the rooting depth is restricted by the seasonal high water table, trees occasionally are subject to windthrow when the soil is wet and winds are strong.

The main limitation for harvesting timber is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not available in areas of this unit.

If this unit is used for homesite development, the main limitations are the hazard of flooding and wetness. Excavation for roads and buildings increases the risk of erosion. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Use of the soil for septic tank absorption fields is limited by the moderately slow permeability and wetness. Constructing septic tank absorption fields when the soil is wet results in reduced infiltration. Use of heavy equipment during construction compacts the soil and thus reduces permeability, particularly during periods when the soil moisture content is high.

This map unit is in capability subclass IIw, irrigated and nonirrigated.

54—Queets silt loam. This very deep, well drained soil is on low river terraces and flood plains. It formed in silty alluvium. Slope is 0 to 5 percent. The native vegetation is mainly conifers and shrubs. Elevation is 50 to 600 feet. The average annual precipitation is 85 to 120 inches, the average annual air temperature is about 51 degrees F, the average frost-free period is 160 to 190 days, and the average growing season (at 28 degrees) is 220 to 250 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is dark brown silt loam 6 inches thick. The subsoil to a depth of 60 inches or more is dark yellowish brown and olive brown silt loam. In some areas of similar included soils, the profile is very gravelly sand to fine sandy loam below a depth of 40 inches.

Included in this unit are small areas of Hoh soils. Also included are small areas of poorly drained soils and soils that have a gravelly substratum at a depth of less than 40 inches. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Queets soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight. This soil is subject to rare periods of flooding.

This unit is used mainly as woodland. It is also used as hayland, pastureland, and homesites.

This unit is suited to the production of western hemlock and red alder. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 160, and on the basis of a 50-year site curve, the estimated mean site index is 114. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 254 cubic feet per acre per year. On the basis of a 50-year site curve, the mean site index for red alder is 100. At the culmination of the mean annual increment (CMAI), the production of red alder at age 40 is 118 cubic feet per acre per year. Sitka spruce is of limited extent in the unit. Among the common forest understory plants are red huckleberry, blue-leaved huckleberry, salal, devilsclub, salmonberry, elderberry, western swordfern, deer fern, ladyfern, and Oregon oxalis.

The main limitation for harvesting timber is muddiness when the soil is wet. Rare periods of flooding may limit

the use of equipment to dry periods. Cable yarding systems can be used to minimize soil damage. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Unsurfaced roads and skid trails are soft and slippery when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in areas of this unit.

Seedling establishment is the main concern in the production of timber. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Reforestation can be accomplished by planting western hemlock or Sitka spruce seedlings. If seed trees are present, natural reforestation of cutover areas by red alder and western hemlock occurs readily.

This unit is suited to hay and pasture. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. In some years, supplemental irrigation is also needed. Use of equipment when the soil is wet results in compaction, which restricts penetration of moisture and roots.

If this unit is used for homesite development, the main limitation is the hazard of flooding. Excavation for roads and buildings increases the risk of erosion. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Use of the soil for septic tank absorption fields is limited by the hazard of flooding. Constructing septic tank absorption fields when the soil is wet results in reduced infiltration. Use of heavy equipment during construction compacts the soil and thus reduces permeability, particularly during periods when the soil moisture content is high.

This map unit is in capability subclass IIIc, nonirrigated.

55—Queets-Tealwhit silt loams, 0 to 5 percent slopes. This map unit is on low terraces and flood plains. The vegetation in areas not cultivated is mainly mixed conifers, deciduous trees, and shrubs. Elevation is 20 to 600 feet. The average annual precipitation is 80 to 120 inches, the average annual air temperature is about 50 degrees F, the average frost-free period is 160 to 190 days, and the average growing season (at 28 degrees) is 220 to 250 days.

This unit is 40 percent Queets silt loam and 40 percent Tealwhit silt loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

The Queets soil is very deep and well drained. It formed in silty alluvium. Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is dark brown silt loam 6 inches thick. The subsoil to a depth of 60 inches or more is dark yellowish brown and olive brown silt loam. In some areas of similar included soils, the profile is very gravelly sand to fine sandy loam below a depth of 40 inches.

Permeability of the Queets soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight. This soil is subject to rare periods of flooding.

The Tealwhit soil is very deep and poorly drained. It formed in alluvium. Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is very dark grayish brown silt loam 6 inches thick. The subsoil is dark grayish brown and olive silty clay loam 32 inches thick. The substratum to a depth of 60 inches or more is olive very fine sandy loam. In some areas of similar included soils, the surface layer is silty clay loam.

Permeability of the Tealwhit soil is slow. Available water capacity is high. Effective rooting depth is limited by a seasonal high water table that is at a depth of 6 to 12 inches from October through May. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to rare periods of flooding.

Included in this unit are small areas of Hoh and Klone soils. Also included are small areas of somewhat poorly drained soils. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

This unit is used mainly as woodland. It is also used as hayland and pastureland.

The Queets soil is suited to the production of western hemlock and red alder. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 160, and on the basis of a 50-year site curve, the estimated mean site index is 114. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 254 cubic feet per acre per year. On the basis of a 50-year site curve, the estimated mean site index for red alder is 100. At the culmination of the mean annual increment (CMAI), the production of red alder at age 40 is 118 cubic feet per acre per year. Sitka spruce is of limited extent on this soil. Among the common forest understory plants are red huckleberry, blue-leaved huckleberry, salal, devilsclub, salmonberry, elderberry, western swordfern, deer fern, ladyfern, and Oregon oxalis.

The main limitation for harvesting timber on the Queets soil is muddiness when the soil is wet. Rare periods of flooding may limit the use of equipment to dry periods. Cable yarding systems can be used to minimize soil damage. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Unsurfaced roads and skid trails are soft and slippery when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not readily available in areas of this unit.

Seedling establishment is the main concern in the production of timber on the Queets soil. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Reforestation can be accomplished by planting western hemlock or Sitka spruce seedlings. If seed trees are present, natural reforestation of cutover areas by red alder and western hemlock occurs readily.

The Tealwhit soil is suited to the production of red alder and western redcedar. On the basis of a 100-year site curve, the estimated mean site index for red alder is 90. At the culmination of the mean annual increment (CMAI), the production of red alder at age 40 is 101 cubic feet per acre per year. Estimates of the site index and production of western redcedar have not been made. The trees of limited extent are western hemlock and Sitka spruce. Among the common forest understory plants are salmonberry, salal, red huckleberry, western swordfern, deer fern, and ladyfern.

The main limitation for harvesting timber on the Tealwhit soil is muddiness when the soil is wet. The rare periods of flooding and the seasonal high water table limit the use of equipment to dry periods. Cable yarding systems can be used to minimize soil damage. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Helicopters and small tracked vehicles commonly are used for western redcedar salvage operations on this unit. Unsurfaced roads and skid trails are soft and sticky when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not available in areas of this unit.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber on the Tealwhit soil. The seasonal high water table reduces root respiration, which results in high mortality of seedlings. Reforestation can be accomplished by planting western hemlock, Sitka spruce, or western redcedar seedlings. If seed trees are present, natural reforestation of cutover areas by red alder occurs readily, and by western hemlock it occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Because the seasonal high water table restricts rooting depth, trees frequently are subject to windthrow when the soil is wet and winds are strong.

The Queets soil is suited to hay and pasture. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Use of equipment when the soil is wet results in compaction, which restricts penetration of moisture and roots.

This map unit is in capability subclass VIw, nonirrigated.

56—Quillayute silt loam, 0 to 8 percent slopes. This very deep, well drained soil is on terraces. It formed in loess and old estuary deposits. The native vegetation is mainly conifers and shrubs. Elevation is 80 to 350 feet. The average annual precipitation is 85 to 120 inches, the average annual air temperature is about 51 degrees F, the average frost-free period is 160 to 190 days, and the average growing season (at 28 degrees) is 220 to 250 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The upper 20 inches of the surface layer is very dark brown and very dark grayish brown silt loam, and the lower 12 inches is very dark grayish brown and very dark gray silty clay loam. The subsoil to a depth of 60 inches or more is yellowish brown and light olive brown silty clay loam. In some areas of similar included soils, the surface layer is silty clay loam.

Included in this unit are small areas of Klone and Wellman soils. Also included are small areas of soils that have slopes of more than 8 percent, soils that have a dark-colored surface layer less than 24 inches thick, and soils that have a very gravelly sand to fine sandy loam substratum. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Quillayute soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight.

This unit is used mainly as woodland. It is also used as hayland, pastureland, and homesites.

This unit is suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 160, and on the basis of a 50-year site curve, the estimated mean site index is 114. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 254 cubic feet per acre per year. The trees of limited extent are Sitka spruce and red alder. Among the common forest understory plants are red huckleberry, salmonberry, salal, western swordfern, deer fern, ladyfern, and Oregon oxalis.

The main limitation for harvesting timber is muddiness when the soil is wet. Cable yarding systems can be used to minimize soil damage. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Unsurfaced roads and skid trails are soft and slippery when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not readily available in this unit.

Seedling establishment is the main concern in the production of timber. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Reforestation can be accomplished by planting western hemlock, or Sitka

spruce seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily. Western hemlock, a shallow rooted tree, is more commonly subject to windthrow than are more deeply rooted trees.

If this unit is used for hay and pasture, it has few limitations. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Use of equipment when the soil is wet results in compaction, which restricts penetration of moisture and roots.

If this unit is used for homesite development, the main limitation is the potential for shrinking and swelling. Properly designing foundations and footings and diverting runoff away from buildings help to prevent structural damage because of shrinking and swelling. Excavation for roads and buildings increases the risk of erosion. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Use of the soil for septic tank absorption fields is limited by the moderate permeability. Constructing septic tank absorption fields when the soil is wet results in reduced infiltration. Use of heavy equipment during construction compacts the soil and thus reduces permeability, particularly during periods when the soil moisture content is high.

This map unit is in capability subclass IIIe, irrigated and nonirrigated.

57—Riverwash. Riverwash consists mainly of nearly level bars of recent sandy and gravelly alluvium. In places it is cobbly. It is in areas adjacent to perennial and intermittent streams and commonly is flooded by runoff from melting snow and heavy rains. Areas of Riverwash support sparse vegetation, consisting of brush and deciduous trees.

This unit is used mainly as wildlife habitat. Some areas are also used as a source of gravel.

This map unit is in capability subclass VIIIw, nonirrigated.

58—Sadie gravelly loam, 0 to 35 percent slopes. This moderately deep, moderately well drained soil is on hills. It formed in glacial till and is underlain by dense, compact glacial till. The native vegetation is mainly mixed conifers, deciduous trees, and shrubs. Elevation is 200 to 1,400 feet. The average annual precipitation is 55 to 75 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is dark brown gravelly loam 4 inches thick. The subsoil is brown and dark yellowish brown gravelly loam 26 inches thick. Compact glacial till is at a depth of 30 inches. Depth to compact glacial till ranges from 25 to 40 inches. In some areas of similar included soils, the surface layer is loam or very gravelly loam.

Included in this unit are small areas of Bellingham, Lyre, Palix, and Schnorbush soils. Also included are small areas of soils that have compact glacial till at a depth of less than 25 inches or more than 40 inches and Sadie soils that have slopes of more than 35 percent. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Sadie soil is moderate to the compact glacial till and very slow through it. Available water capacity is moderate. Effective rooting depth is 25 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. Water is perched above the compact glacial till from December through March. The effect of the layer of compact glacial till on use and management is similar to that of a hardpan.

This unit is used as woodland.

This unit is suited to the production of Douglas-fir and western hemlock. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 155 and for western hemlock it is 159. On the basis of a 50-year site curve, the estimated mean site index for Douglas-fir is 118 and for western hemlock it is 112. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 164 cubic feet per acre per year and the production of western hemlock at age 50 is 252 cubic feet per acre per year. The trees of limited extent are Sitka spruce, western redcedar, grand fir, and red alder. Among the common forest understory plants are salal, red huckleberry, elderberry, rose, blackberry, western swordfern, deer fern, and bedstraw. Floral use of salal and western swordfern is common.

The main limitation for harvesting timber is muddiness when the soil is wet. The seasonal high water table limits the use of equipment to dry periods. Cable yarding systems can be used to minimize soil damage. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in this unit.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Because the rooting depth is restricted by the compact glacial till, trees occasionally are subject to windthrow. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural

reforestation of cutover areas by Douglas-fir and western hemlock occurs periodically.

This map unit is in capability subclass IVe, nonirrigated.

59—Schnorbush loam, 0 to 20 percent slopes. This very deep, well drained soil is on hills. It formed in glacial till and in material weathered from siltstone. The native vegetation is mainly conifers and shrubs. Elevation is 200 to 1,400 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 220 to 260 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is very dark grayish brown loam 4 inches thick. The subsoil is dark yellowish brown and olive brown loam 24 inches thick. The substratum to a depth of 60 inches or more is light olive brown and olive brown silty clay loam and loam. In some areas of similar included soils, the surface layer is gravelly loam or clay loam.

Included in this unit are small areas of Bellingham, Casey, Elwha, Neilton, and Sadie soils. Also included are small areas of Schnorbush soils that have slopes of more than 20 percent and small areas of moderately well drained soils. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Schnorbush soil is moderately slow. Available water capacity is moderately high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight.

Most areas of this unit are used as woodland. A few areas are used as homesites.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 160, and on the basis of a 50-year site curve, the estimated mean site index is 117. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 65 is 170 cubic feet per acre per year. The trees of limited extent are grand fir, western hemlock, western redcedar, red alder, and bigleaf maple. Among the common forest understory plants are salal, oceanspray, red huckleberry, Oregon-grape, twinflower, bedstraw, western swordfern, western brackenfern, and deer fern. Floral use of salal and western swordfern is common on this unit.

The main limitation for harvesting timber is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in this unit.

Seedling establishment is the main concern in the production of timber. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically.

If this unit is used for homesite development, the main limitation is steepness of slope. Preserving the existing plant cover during construction helps to control erosion. Excavation for roads and buildings increases the hazard of erosion. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Use of the soil for septic tank absorption fields is limited by the moderately slow permeability and steepness of slope. The steepness of slope is a concern when installing septic tank absorption fields. Absorption lines should be installed on the contour. Constructing septic tank absorption fields when the soil is wet results in reduced infiltration. Use of heavy equipment during construction compacts the soil and thus reduces permeability, particularly during periods when the soil moisture content is high.

This map unit is in capability subclass IIIe, nonirrigated.

60—Schnorbush loam, 20 to 55 percent slopes. This very deep, well drained soil is on hills. It formed in glacial till and in material weathered from siltstone. The native vegetation is mainly conifers and shrubs. Elevation is 200 to 1,400 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 220 to 260 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is very dark grayish brown loam 4 inches thick. The subsoil is dark yellowish brown and olive brown loam 24 inches thick. The substratum to a depth of 60 inches or more is light olive brown and olive brown silty clay loam and loam. In some areas of similar included soils, the surface layer is gravelly loam or clay loam.

Included in this unit are small areas of Elwha, Louella, Neilton, Sadie, and Terbies soils. Also included are small areas of Schnorbush soils that have slopes of less than 20 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Schnorbush soil is moderately slow. Available water capacity is moderately high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as woodland.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 160, and on the basis of a 50-year site curve, the estimated mean site index is 117.

At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 65 is 170 cubic feet per acre per year. The trees of limited extent are grand fir, western hemlock, western redcedar, red alder, and bigleaf maple. Among the common forest understory plants are salal, oceanspray, red huckleberry, Oregon-grape, twinflower, bedstraw, western swordfern, western brackenfern, and deer fern.

The main limitation for harvesting timber is steepness of slope. Steepness of slope restricts the use of wheeled and tracked equipment in skidding operations; cable yarding systems generally are safer and disturb the soil less. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in areas of this unit. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment is the main concern in the production of timber. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically.

This map unit is in capability subclass VIe, nonirrigated.

61—Schnorbush loam, cool, 40 to 80 percent slopes. This very deep, well drained soil is on hills. It formed in glacial till and residuum derived from siltstone. The native vegetation is mainly conifers and shrubs. Elevation is 200 to 1,400 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 220 to 240 days. Persistent cool winds are common on this unit.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is very dark grayish brown loam 4 inches thick. The subsoil is dark yellowish brown and olive brown loam 24 inches thick. The substratum to a depth of 60 inches or more is light olive brown and olive brown silty clay loam and loam. In some areas of similar included soils, the surface layer is gravelly loam or clay loam.

Included in this unit are small areas of Neilton and Terbies soil. Also included are small areas of cool Schnorbush soils that have slopes of less than 40 percent. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Schnorbush soil is moderately slow. Available water capacity is moderately high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is severe.

This unit is used as woodland.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 150, and on the basis of a 50-year site curve, the estimated mean site index is 105. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 158 cubic feet per acre per year. Areas on ridgetops that are subject to strong, persistent winds are less productive than other areas of this unit. The trees of limited extent are grand fir, western hemlock, western redcedar, and red alder. Among the common forest understory plants are salal, oceanspray, red huckleberry, Oregon-grape, twinflower, bedstraw, western swordfern, western brackenfern, and deer fern.

The main limitation for harvesting timber is steepness of slope. Cable yarding systems are suitable for use on this unit. Harvesting systems that lift logs entirely off the ground reduce the disturbance of the protective layer of duff. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in areas of this unit. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment is the main concern in the production of timber. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. The mortality of seedlings is higher in areas on ridgetops that are subject to strong, persistent winds than in other areas of this unit.

This map unit is in capability subclass VIIe, nonirrigated.

62—Schnorbush-Casey complex, 0 to 20 percent slopes. This map unit is on hills and terraces. The native vegetation is mainly conifers and shrubs. Elevation is 200 to 600 feet. The average annual precipitation is 40 to 50 inches, the average annual air temperature is about 49 degrees F, the average frost-free period is 160 to 200 days, and the average growing season (at 28 degrees) is 230 to 260 days.

The unit is 50 percent Schnorbush loam, 0 to 20 percent slopes, and 30 percent Casey silty clay loam, 0 to 10 percent slopes. The components of this unit are so

intricately intermingled that it was not practical to map them separately at the scale used.

The Schnorbush soil is very deep and well drained. It formed in glacial till and in material weathered from siltstone. Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is very dark grayish brown loam 4 inches thick. The subsoil is dark yellowish brown and olive brown loam 24 inches thick. The substratum to a depth of 60 inches or more is light olive brown and olive brown silty clay loam and loam. In some areas of similar included soils, the surface layer is gravelly loam or clay loam.

Permeability of the Schnorbush soil is moderately slow. Available water capacity is moderately high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight.

The Casey soil is very deep and somewhat poorly drained. It formed in stratified glaciolacustrine and marine sediment. Typically, the surface layer is very dark grayish brown silty clay loam 8 inches thick. The subsoil is grayish brown, dark gray, and olive gray silty clay 28 inches thick. The substratum to a depth of 60 inches or more is stratified, olive silty clay loam to loamy fine sand. In some areas of similar included soils, the surface layer is loam, silt loam, or fine sandy loam.

Permeability of the Casey soil is very slow. Available water capacity is moderately high. Effective rooting depth is limited by a seasonal perched water table that is at a depth of 2 to 4 feet from December through April. Runoff is slow, and the hazard of water erosion is slight.

Included in this unit are small areas of Bellingham, Elwha, McKenna, Mukilteo, and Neilton soils. Also included are small areas of moderately well drained soils and Schnorbush soils that have slopes of more than 20 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

This unit is used mainly as woodland, hayland, and pastureland. It is also used as homesites.

The Schnorbush soil is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 160, and on the basis of a 50-year site curve, the estimated mean site index is 117. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 65 is 170 cubic feet per acre per year. The trees of limited extent are grand fir, western hemlock, western redcedar, red alder, and bigleaf maple. Among the common forest understory plants are salal, oceanspray, red huckleberry, Oregon-grape, twinflower, bedstraw, western swordfern, western brackenfern, and deer fern. Floral use of salal and western swordfern is common on this soil.

The main limitation for harvesting timber on the Schnorbush soil is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not readily available in areas of this soil.

Seedling establishment is the main concern in the production of timber on the Schnorbush soil. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically.

The Casey soil is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 117, and on the basis of a 50-year site curve, the estimated mean site index is 94. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 110 cubic feet per acre per year. The trees of limited extent are bigleaf maple, western redcedar, western hemlock, and red alder. Among the common forest understory plants are salal, red huckleberry, blackberry, oceanspray, salmonberry, western swordfern, bedstraw, Indian plum, and western brackenfern.

The main limitation for harvesting timber on the Casey soil is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Cable yarding systems can be used to minimize soil damage. Unsurfaced roads and skid trails are soft and sticky when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Road construction is easier during dry periods in summer. Rock for road construction is not available in areas of this soil.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber on the Casey soil. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Trees occasionally are subject to windthrow because the rooting depth is restricted by the seasonal perched water table.

If the Casey soil is used for hay and pasture, the main limitation is wetness. Use of equipment when the soil is wet results in compaction, which restricts penetration of moisture and roots. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Excessive water on the surface can be removed by tile drains and ditches. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion.

If the Schnorbush soil is used for homesite development, the main limitation is steepness of slope. Preserving the existing plant cover during construction helps to control erosion. Buildings and roads should be designed to offset the limited ability of the soils to support a load.

Use of this soil for septic tank absorption fields is limited by steepness of slope and the moderately slow permeability. The steepness of slope is a concern when installing septic tank absorption fields. Absorption lines should be installed on the contour. If the soil is used for septic tank absorption fields, the limitation of moderately slow permeability can be overcome by increasing the size of the absorption field. Constructing septic tank absorption fields when the soil is wet results in reduced infiltration. Use of heavy equipment during construction compacts the soil and reduces permeability, particularly during periods when the soil moisture content is high.

If the Casey soil is used for homesite development, the main limitation is wetness. Drainage is needed if roads and buildings are constructed. Excess water can be removed by using suitably designed drainage systems. Excavation for roads and buildings increases the risk of erosion. Buildings and roads should be designed to offset the limited ability of the soil to support a load.

Use of this soil for septic tank absorption fields is limited by wetness and the very slow permeability. Septic tank absorption fields do not function properly during rainy periods. Constructing septic tank absorption fields when the soil is wet results in reduced infiltration. Use of heavy equipment during construction compacts the soil and thus reduces permeability, particularly during periods when the soil moisture content is high.

This map unit is in capability subclass IIIe, nonirrigated.

63—Sequim very gravelly sandy loam. This very deep, somewhat excessively drained soil is on terraces and alluvial fans. It formed in old alluvium. Slope is 0 to 5 percent. The vegetation in areas not cultivated is mainly mixed conifers, deciduous trees, shrubs, and grasses. Elevation is 20 to 300 feet. The average annual precipitation is 16 to 22 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is 170 to 200 days.

Typically, the surface layer is very dark brown very gravelly sandy loam 10 inches thick. The next layer is dark brown extremely cobbly loamy sand 13 inches thick. Below this to a depth of 60 inches or more is brown and dark grayish brown extremely cobbly sand. In some areas of similar included soils, the surface layer is very cobbly sandy loam, gravelly loam, or cobbly loam.

Included in this unit are small areas of Carlsborg, Clallam, Dungeness, and Hoypus soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Sequim soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used mainly as hayland, pastureland, and cropland. It is also used as homesites and woodland.

If this unit is used for hay and pasture, the main limitations are droughtiness and cobbles on the surface. Irrigation is required for maximum production.

If this unit is used for crops, it is limited mainly by droughtiness of the surface layer. Crops commonly grown include strawberries, small grain, raspberries, and truck crops. In summer, irrigation is needed for maximum production of most crops. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Because this unit is droughty, applications of irrigation water should be light and frequent. The organic matter content can be maintained by using all crop residue, plowing under green manure crops, and using a suitable rotation. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate. Crop residue left on the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is suited to homesite development. The main limitation is large stones. Excavation for roads and buildings increases the hazard of erosion. Cutbanks are not stable and are subject to caving in. Use of the soil in this unit for septic tank absorption fields is limited by the rapid permeability of the substratum. This soil is a poor filter for septic tank absorption fields.

The Sequim soil is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 95, and on the basis of a 50-year site curve, the estimated mean site index is 75. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 77 cubic feet per acre per year. Among the common forest understory plants are Oregon-grape, trailing blackberry, western swordfern, salal, and red huckleberry.

Seedling establishment is the main concern in the production of timber. The low precipitation during the growing season and the droughtiness of the surface layer contribute to seedling mortality. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. This unit is suited to year-round logging operations. Logging roads require suitable surfacing for year-round use. Rounded gravel and cobbles are readily available in areas of this unit.

This map unit is in capability subclass VIs, irrigated and nonirrigated.

64—Sequim-McKenna-Mukilteo complex. This map unit is on terraces and in basins. Slope is 0 to 5 percent. The native vegetation is mainly mixed conifers, deciduous trees, shrubs, grasses, and sedges. Elevation is 100 to 300 feet. The average annual precipitation is 16 to 22 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is 160 to 200 days.

This unit is 35 percent Sequim very gravelly sandy loam, 0 to 5 percent slopes; 35 percent McKenna gravelly silt loam, 0 to 5 percent slopes; and 20 percent Mukilteo muck, 0 to 1 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

The Sequim soil is very deep and somewhat excessively drained. It formed in old alluvium. The soil is on terraces. Typically, the surface layer is very dark brown very gravelly sandy loam 10 inches thick. The next layer is dark brown extremely cobbly loamy sand 13 inches thick. Below this to a depth of 60 inches or more is brown and dark grayish brown extremely cobbly sand. In some areas of similar included soils, the surface layer is very cobbly sandy loam, gravelly loam, or cobbly loam.

Permeability of the Sequim soil is rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

The McKenna soil is moderately deep and poorly drained. It formed in glacial drift. The soil is in basins. Typically, the surface layer is very dark gray gravelly silt loam 8 inches thick. The upper part of the subsoil is grayish brown gravelly loam 10 inches thick, and the lower part is light olive gray and olive gray very gravelly loam and very gravelly sandy loam 14 inches thick. Compact glacial till is at a depth of 32 inches. Depth to compact glacial till ranges from 20 to 40 inches. In some areas of similar included soils, the surface layer is gravelly silt loam. The effect of the layer of compact glacial till on use and management is similar to that of a hardpan.

Permeability of the McKenna soil is slow to the compact glacial till and very slow through it. Available water capacity is moderate. Effective rooting depth is limited by a seasonal perched water table that extends from near the surface to a depth of 6 inches below the surface from November through April. Runoff is ponded, and the hazard of water erosion is slight.

The Mukilteo soil is very deep and poorly drained. It formed in organic material. The soil is in basins. Typically, the surface layer is black, partially decomposed organic material about 10 inches thick. The underlying material to a depth of 60 inches or more is dark reddish brown and black, partially decomposed organic material.

Permeability of the Mukilteo soil is moderate. Available water capacity is high. Effective rooting depth is limited by a seasonal high water table that is at or near the surface from October through May. Runoff is ponded, and the hazard of water erosion is slight.

Included in this unit are small areas of Bellingham, Carlsborg, and Clallam soils. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

Most areas of this unit are used as hayland and pastureland. A few areas are used as homesites, wildlife habitat, and woodland.

If the Sequim soil is used for hay and pasture, the main limitation is droughtiness. Irrigation is required for maximum production.

The Mukilteo soil is poorly suited to hay and pasture.

If the McKenna soil is used for hay and pasture, the main limitation is wetness. Wetness limits the choice of plants and the period of cutting or grazing and increases the risk of winterkill. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition. Use of equipment when the soil is wet results in compaction, which impairs tilth.

The Sequim soil is suited to homesite development. The main limitation is large stones. Excavation for roads and buildings increases the risk of erosion. Cutbanks are not stable and are subject to caving in.

Use of this soil for septic tank absorption fields is limited by the rapid permeability. The soil is a poor filter.

The Sequim soil is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 95, and on the basis of a 50-year site curve, the estimated mean site index is 75. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 60 is 77 cubic feet per acre per year. Among the common forest understory plants are Oregon-grape, blackberry, western swordfern, salal, and red huckleberry.

Seedling establishment is the main concern in the production of timber. The low precipitation during the growing season and the droughtiness of the surface layer contribute to seedling mortality. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. This soil is suited to year-round logging operations. Logging roads require suitable surfacing for year-round use.

The McKenna soil is suited to the production of red alder. On the basis of a 50-year site curve, the estimated mean site index for red alder is 90. At the culmination of the mean annual increment (CMAI), the production of red alder at age 40 is 101 cubic feet per acre per year. Trees of limited extent are western redcedar and western hemlock. Among the common forest understory plants are red huckleberry, Oregon-grape, vine maple, western swordfern, and bedstraw. Skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not available in areas of this soil.

The Mukilteo soil is suited to the production of red alder. On the basis of a 50-year site curve, the estimated mean site index for red alder is 87. At the culmination of the mean annual increment (CMAI), the production of red alder at age 40 is 96 cubic feet per acre per year. Trees of limited extent are western redcedar and western hemlock. Among the common forest understory plants are trailing blackberry, red elderberry, trillium, devilsclub, and Siberian minerslettuce.

The main limitation for harvesting timber is muddiness when the soil is wet. A seasonal high water table severely limits the use of wheeled or tracked equipment. Use of cable yarding systems that lift logs entirely off the ground reduces soil damage.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. The seasonal high water table reduces root respiration, which results in high mortality of seedlings. Reforestation can be accomplished by planting western redcedar seedlings. If seed trees are present, natural reforestation of cutover areas by red alder occurs periodically. When openings are made in the canopy, invading brushy plants can prevent the establishment of seedlings. Because the rooting depth is restricted by the seasonal high water table, trees frequently are subject to windthrow when the soil is wet and winds are strong.

This map unit is in capability subclass VIw, nonirrigated.

65—Snahopish very gravelly loam, 35 to 70 percent slopes. This very deep, well drained soil is on mountainsides. It formed in loess, residuum, and colluvium derived from sandstone. The native vegetation is mainly conifers and shrubs. Elevation is 300 to 1,800 feet. The average annual precipitation is 90 to 130 inches, the average annual air temperature is about 47 degrees F, and the average growing season (at 28 degrees) is 210 to 240 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is dark brown very gravelly loam 10 inches thick. The subsoil is dark yellowish brown very cobbly loam 31 inches thick. The substratum to a depth of 60 inches or more is dark yellowish brown extremely cobbly loam. In some areas of similar included soils, the surface layer is very gravelly silt loam, very cobbly loam, or gravelly loam.

Included in this unit are small areas of Ilwaco, Klone, Ozette, and Solleks soils. Also included are small areas of Snahopish soils that have slopes of more than 70 percent and small areas of Rock outcrop. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Snahopish soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is severe.

This unit is used as woodland.

This unit is suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 143, and on the basis of a 50-year site curve, the estimated mean site index is 102. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 224 cubic feet per acre per year. Trees of limited extent are Sitka spruce and Pacific silver fir. Among the common forest understory plants are salmonberry, red huckleberry, salal, vine maple, Oregon oxalis, western swordfern, deer fern, and ladyfern.

The main limitation for harvesting timber is steepness of slope. Steepness of slope restricts the use of wheeled and tracked equipment in skidding operations; cable yarding systems generally are safer and disturb the soil less. Harvesting systems that lift logs entirely off the ground reduce the disturbance of the protective layer of duff. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is readily available in this unit. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling mortality is the main concern in the production of timber. Reforestation can be accomplished by planting western hemlock or Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Western hemlock, a shallow rooted tree, is more commonly subject to windthrow than are more deeply rooted trees.

This map unit is in capability subclass VIIe, nonirrigated.

66—Solduc very gravelly sandy loam. This very deep, somewhat excessively drained soil is on terraces. It formed in glacial outwash that has loess and volcanic ash in the upper part. Slope is 0 to 5 percent. The native vegetation is mainly conifers and shrubs. Elevation is 50 to 800 feet. The average annual precipitation is 80 to 120 inches, the average annual air temperature is about 50 degrees F, and the average growing season (at 28 degrees) is 220 to 250 days.

Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark reddish brown very gravelly sandy loam 7 inches thick. The subsoil is dark reddish brown and dark brown very gravelly sandy loam 23 inches thick. The substratum to a depth of 60 inches or more is dark yellowish brown and

dark grayish brown extremely gravelly loamy sand and extremely gravelly sand. In some areas of similar included soils, the surface layer is gravelly loam or very gravelly loam.

Included in this unit are small areas of Klone, Lyre, and Queets soils. Also included are small areas of sandy soils and poorly drained soils in old river channels. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Solduc soil is moderate to the substratum and rapid through it. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight.

This unit is used as woodland and homesites.

This unit is suited to the production of western hemlock and Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index is 145 for western hemlock and 142 for Douglas-fir. On the basis of a 50-year site curve, the estimated mean site index is 103 for western hemlock and 111 for Douglas-fir. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 228 cubic feet per acre per year and the production of Douglas-fir at age 65 is 148 cubic feet per acre per year. Sitka spruce is of limited extent in the unit. Among the common forest understory plants are red huckleberry, salal, vine maple, cascara buckthorn, devilsclub, salmonberry, twinflower, western swordfern, deer fern, ladyfern, and bedstraw.

This unit is suited to year-round logging operations. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Logging roads require suitable surfacing for year-round use. Rounded gravel for road construction is readily available in areas of this unit.

Seedling establishment is the main concern in the production of timber. Reforestation can be accomplished by planting western hemlock or Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Western hemlock, a shallow rooted tree, is more commonly subject to windthrow than are more deeply rooted trees.

This unit is suited to homesite development. The main limitation is the content of gravel. Excavation for roads and buildings increases the hazard of erosion. Cutbanks are not stable and are subject to caving in.

Use of the soil in this unit for septic tank absorption fields is limited by the rapid permeability of the substratum. The soil is a poor filter.

This map unit is in capability subclass IVs, nonirrigated.

67—Solleks very gravelly loam, 60 to 90 percent slopes. This moderately deep, well drained soil is on mountainsides. It formed in residuum and colluvium derived from sandstone and conglomerate. The native vegetation is mainly conifers and shrubs. Elevation is 600 to 1,600 feet. The average annual precipitation is 100 to 140 inches, the average annual air temperature is about 45 degrees F, and the average growing season (at 28 degrees) is 220 to 240 days.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is dark brown very gravelly loam 10 inches thick. The subsoil is dark yellowish brown very cobbly loam and extremely cobbly loam 23 inches thick. Sandstone is at a depth of 33 inches. Depth to bedrock ranges from 20 to 40 inches. In some areas of similar included soils, the surface layer is very gravelly silt loam, very cobbly loam, or very cobbly silt loam.

Included in this unit are small areas of Snahopish soils. Also included are small areas of soils that are less than 20 inches deep to bedrock, Rock outcrop, and Solleks soils that have slopes of less than 60 percent or more than 90 percent. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Solleks soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is severe.

This unit is used as woodland.

This unit is suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 123, and on the basis of a 50-year site curve, the estimated mean site index is 90. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 186 cubic feet per acre per year. Trees of limited extent are Sitka spruce and Pacific silver fir. Among the common forest understory plants are salmonberry, red huckleberry, salal, vine maple, Oregon oxalis, western swordfern, deer fern, and ladyfern.

The main limitation for harvesting timber is steepness of slope. Cable yarding systems are suitable for use on this unit. Harvesting systems that lift logs entirely off the ground reduce the disturbance of the protective layer of duff. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is readily available in areas of this unit. During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. Reforestation can be accomplished by planting western hemlock or Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily. The droughtiness of the surface layer contributes to mortality of seedlings, especially on south- and southwest-facing slopes. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Trees occasionally are subject to windthrow when the soil is wet and winds are strong, because rooting depth is restricted by the underlying bedrock.

This map unit is in capability subclass VIIe, nonirrigated.

68—Solleks very gravelly loam, cool, 60 to 90 percent slopes. This moderately deep, well drained soil is on mountainsides. It formed in residuum and colluvium derived from sandstone and conglomerate. The native vegetation is mainly conifers and shrubs. Elevation is 1,600 to 2,000 feet. The average annual precipitation is 100 to 140 inches, the average annual air temperature is about 45 degrees F, and the average growing season (at 28 degrees) is 200 to 220 days. Persistent, cool winds are common on this unit.

Typically, the surface is covered with a mat of organic material 1 inch thick. The surface layer is dark brown very gravelly loam 10 inches thick. The subsoil is dark yellowish brown very cobbly loam and extremely cobbly loam 23 inches thick. Sandstone is at a depth of 33 inches. Depth to bedrock ranges from 20 to 40 inches. In some areas of similar included soils, the surface layer is very gravelly silt loam, very cobbly loam, or very cobbly silt loam.

Included in this unit are small areas of Snahopish soils. Also included are small areas of soils that are colder than this Solleks soil, soils that are less than 20 inches deep to bedrock, Rock outcrop, and Solleks soils that have slopes of less than 60 percent or more than 90 percent. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Solleks soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is severe.

This unit is used as woodland.

This unit is suited to the production of western hemlock and Pacific silver fir. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 113, and on the basis of a 50-year site curve, the estimated mean site index is 85. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 166 cubic feet per acre per year. Estimates of the site index and production of Pacific silver fir have not been made. Sitka spruce is of limited extent in this unit. Among the common forest understory plants are salmonberry, red huckleberry, salal, vine maple, Oregon oxalis, western swordfern, deer fern, and ladyfern.

The main limitation for harvesting timber is steepness of slope. Cable yarding systems are suitable for use on this unit. Harvesting systems that lift logs entirely off the ground reduce the disturbance of the protective layer of duff. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is readily available in this unit. During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment is the main concern in the production of timber. Reforestation can be accomplished by planting western hemlock or Pacific silver fir seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock and Pacific silver fir occurs readily. The droughtiness of the surface layer contributes to mortality of seedlings, especially on south- and southwest-facing slopes. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Trees occasionally are subject to windthrow when the soil is wet and winds are strong, because rooting depth is restricted by the underlying bedrock.

This map unit is in capability subclass VIIe, nonirrigated.

69—Tealwhit silt loam, 0 to 5 percent slopes. This very deep, poorly drained soil is on low terraces. It formed in alluvium. The native vegetation is mainly mixed conifers, deciduous trees, shrubs, and sedges. Elevation is 20 to 1,200 feet. The average annual precipitation is 80 to 140 inches, the average annual air temperature is about 49 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is very dark grayish brown silt loam 6 inches thick. The subsoil is dark grayish brown and olive silty clay loam 32 inches thick. The substratum to a depth of 60 inches or more is olive very fine sandy loam. In some areas of similar included soils, the surface layer is silty clay loam.

Included in this unit are small areas of Klone, Kydaka, Ozette, and Queets soils. Also included are small areas of somewhat poorly drained soils and organic soils. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Tealwhit soil is slow. Available water capacity is high. Effective rooting depth is limited by a seasonal high water table that is at a depth of 6 to 12 inches from October through May. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to rare periods of flooding.

This unit is used as woodland.

This unit is suited to the production of red alder and western redcedar. On the basis of a 50-year site curve, the estimated mean site index for red alder is 90. At the culmination of the mean annual increment (CMAI), the production of red alder at age 40 is 101 cubic feet per acre per year. Estimates of the site index and production of western redcedar have not been made. Among the trees of limited extent are western hemlock and Sitka spruce. Among the common forest understory plants are salmonberry, salal, red huckleberry, western swordfern, deer fern, and ladyfern.

The main limitation for harvesting timber is muddiness when the soil is wet. The seasonal high water table limits the use of equipment to dry periods. Cable yarding systems or low-ground-pressure skidding equipment can be used to minimize soil damage. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment. Helicopters and small tracked vehicles commonly are used for western redcedar salvage operations on this unit. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not readily available in areas of this unit.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. Reforestation can be accomplished by planting western hemlock, Sitka spruce, or western redcedar seedlings. If seed trees are present, natural reforestation of cutover areas by red alder occurs readily, and by western hemlock it occurs periodically. Seedling mortality may be high in areas that are subject to flooding. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Because rooting depth is restricted by the seasonal high water table, trees frequently are subject to windthrow during periods when the soil is excessively wet and the winds are strong.

This map unit is in capability subclass VIw, nonirrigated.

70—Terbies very gravelly sandy loam, 30 to 65 percent slopes. This deep, well drained soil is on mountainsides. It formed in residuum and colluvium derived from sandstone, siltstone, and conglomerate. The native vegetation is mainly conifers and shrubs. Elevation is 800 to 2,000 feet. The average annual precipitation is 40 to 70 inches, the average annual air temperature is about 46 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark brown very gravelly sandy loam 3 inches thick. The upper 20 inches of the subsoil is dark yellowish brown very gravelly sandy loam and extremely gravelly sandy loam, and the lower 10 inches is dark yellowish brown extremely channery sandy loam. The substratum is light olive brown extremely channery sandy loam 12 inches thick. Sandstone is at a depth of 45 inches. Depth to bedrock ranges from 40 to 60 inches or more. In some areas of similar included soils, the surface layer is very gravelly loam, very channery loam, or very gravelly silt loam.

Included in this unit are small areas of Elwha, Louella, and Schnorbush soils. Also included are small areas of Terbies soils that have slopes of less than 30 percent or more than 65 percent and soils that are less than 40 inches deep to bedrock Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Terbies soil is moderate. Available water capacity is low. Effective rooting depth is 40 to 60 inches or more. Runoff is medium, and the hazard of water erosion is severe.

This unit is used as woodland.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 124, and on the basis of a 50-year site curve, the estimated mean site index is 93. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 70 is 121 cubic feet per acre per year. Trees of limited extent are western hemlock, grand fir, western redcedar, and bigleaf maple. Among the common forest understory plants are salal, oceanspray, red huckleberry, rose, Oregon-grape, twinflower, blackberry, western swordfern, deer fern, and bedstraw.

The main limitation for harvesting timber is steepness of slope. Steepness of slope restricts the use of wheeled and tracked equipment in skidding operations; cable yarding systems generally are safer and disturb the soil less (fig. 6). Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Logging roads require suitable surfacing for year-round use. Rock for road construction is readily available in areas of this unit. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment is the main concern in the production of timber. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. The droughtiness of the

Figure 6.—Douglas-fir in an area of Terbies very gravelly sandy loam, 30 to 65 percent slopes, where use of a highlead cable yarding system has left logged areas undisturbed.

surface layer contributes to seedling mortality. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

This map unit is in capability subclass VIe, nonirrigated.

71—Terbies very gravelly sandy loam, 65 to 85 percent slopes. This deep, well drained soil is on mountainsides. It formed in residuum and colluvium derived from sandstone, siltstone, and conglomerate. The native vegetation is mainly conifers and shrubs. Elevation is 800 to 2,000 feet. The average annual precipitation is 40 to 70 inches, the average annual air temperature is about 46 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark brown very gravelly sandy loam 3 inches thick. The upper 20 inches of the subsoil is dark yellowish brown very gravelly sandy loam and extremely gravelly sandy loam, and the lower 10 inches is dark yellowish brown extremely channery sandy loam. The substratum is light olive brown extremely channery sandy loam 12 inches thick. Sandstone is at a depth of 45 inches. Depth to bedrock ranges from 40 to 60 inches or more. In some areas of similar included soils, the surface layer is very

gravelly loam, very channery loam, or very gravelly silt loam.

Included in this unit are small areas of Louella soils. Also included are small areas of Rock outcrop, soils that are less than 40 inches deep to bedrock, and Terbies soils that have slopes of less than 65 percent or more than 85 percent. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Terbies soil is moderate. Available water capacity is low. Effective rooting depth is 40 to 60 inches or more. Runoff is medium, and the hazard of water erosion is severe.

This unit is used as woodland.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 124, and on the basis of a 50-year site curve, the estimated mean site index is 93. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 70 is 121 cubic feet per acre per year. Trees of limited extent are western hemlock, grand fir, western redcedar, and bigleaf maple. Among the common forest understory plants are salal, oceanspray, red huckleberry, rose, Oregon-grape, twinflower, blackberry, western swordfern, deer fern, and bedstraw.

The main limitation for harvesting timber is steepness of slope. Cable yarding systems are suitable for use on this unit. Harvesting systems that lift logs entirely off the ground reduce the disturbance of the protective layer of duff. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. Logging roads require suitable surfacing for year-round use. Rock for road construction is readily available in areas of this unit. During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment is the main concern in the production of timber. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. The droughtiness of the surface layer contributes to seedling mortality. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

This map unit is in capability subclass VIIe, nonirrigated.

72—Terbies-Rock outcrop complex, 65 to 85 percent slopes. This map unit is on mountainsides. The native vegetation is mainly conifers and shrubs. Elevation is 800 to 2,000 feet. The average annual precipitation is 40 to 70 inches, the average annual air temperature is about 46 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

The unit is 65 percent Terbies very gravelly sandy loam, 65 to 85 percent slopes, and 15 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

The Terbies soil is deep and well drained. It formed in residuum and colluvium derived from sandstone, siltstone, and conglomerate. Typically, the surface is covered with a mat of organic material 2 inches thick. The surface layer is dark brown very gravelly sandy loam 3 inches thick. The upper 20 inches of the subsoil is dark yellowish brown very gravelly sandy loam and extremely gravelly sandy loam, and the lower 10 inches is dark yellowish brown extremely channery sandy loam. The substratum is light olive brown extremely channery sandy loam 12 inches thick. Sandstone is at a depth of 45 inches. Depth to bedrock ranges from 40 to 60 inches or more. In some areas of similar included soils, the surface layer is very gravelly loam, very channery loam, or very gravelly silt loam.

Included in this unit are small areas of Louella soils. Also included are small areas of soils that are less than 40 inches deep to bedrock and Terbies soils that have slopes of less than 65 percent or more than 85 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Terbies soil is moderate. Available water capacity is low. Effective rooting depth is 40 to 60 inches or more. Runoff is medium, and the hazard of water erosion is severe.

Rock outcrop consists of areas that are more than 90 percent exposed bedrock.

This unit is used as woodland.

The Terbies soil is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 124, and on the basis of a 50-year site curve, the estimated mean site index is 93. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 70 is 121 cubic feet per acre per year. Trees of limited extent are western hemlock, grand fir, western redcedar, and bigleaf maple. Among the common forest understory plants are salal, oceanspray, red huckleberry, rose, Oregon-grape, twinflower, blackberry, western swordfern, deer fern, and bedstraw.

The main limitations for harvesting timber are steepness of slope and the areas of Rock outcrop. Cable yarding systems are suitable for use on this unit. Harvesting systems that lift logs entirely off the ground reduce the disturbance of the protective layer of duff. Steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying unless they are protected by water bars or vegetation. The areas of Rock outcrop hinder yarding operations and may cause breakage of

timber. Logging roads require suitable surfacing for year-round use. Rock for road construction is readily available in areas of this unit. During the first few years following road construction in combination with clearcutting, road failures and landslides are likely to occur. Establishing plant cover on the steeper slopes that have been cut or filled reduces erosion.

Seedling establishment is the main concern in the production of timber. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. The droughtiness of the surface layer contributes to seedling mortality. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

This map unit is in capability subclass VIIs, nonirrigated.

73—Typic Xerofluvents, nearly level. These very deep, somewhat excessively drained soils are on flood plains. They formed in recent alluvium. Slope is 0 to 5 percent. The native vegetation is mainly mixed conifers, deciduous trees, and shrubs. Elevation is near sea level to 300 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 230 to 260 days.

No single profile is typical of Typic Xerofluvents, but one commonly observed in the survey area has a surface that is covered with a mat of organic material about 2 inches thick. The surface layer is very dark grayish brown very fine sandy loam about 6 inches thick. The upper 24 inches of the substratum is very dark gray sand, and the lower part to a depth of 60 inches or more is very dark gray extremely cobbly sand. In some areas of similar included soils, the surface layer is sandy loam or loamy sand. These soils vary widely in texture within short distances.

Included in this unit are small areas of Riverwash. Also included are small areas of soils that are more than 35 percent pebbles and cobbles in the upper part of the substratum. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Typic Xerofluvents is rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. These soils are subject to occasional, brief periods of flooding from December through April.

This unit is used as woodland.

This unit is suited to the production of red alder. On the basis of a 50-year site curve, the estimated mean site index for red alder is 98. At the culmination of the mean annual increment (CMAI), the production of red alder at age 40 is 115 cubic feet per acre per year. Trees of limited extent are grand fir and Douglas-fir. Among the common forest understory plants are western swordfern, red huckleberry, creambush oceanspray, and salmonberry.

The main limitation for harvesting timber is the hazard of flooding. The risk of flooding limits the use of equipment to dry periods. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rounded gravel and cobbles for road construction are readily available in areas of this unit. Disturbance of the protective layer of duff can be reduced with the careful use of wheeled and tracked equipment.

Seedling mortality and plant competition are the main concerns in the production of timber. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by red alder occurs readily. The droughtiness of the surface layer contributes to seedling mortality. Seedlings planted in the less fertile subsoil exhibit poor growth and vigor. Seedling mortality may be high in areas that are subject to flooding. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

This map unit is in capability subclass VIw, nonirrigated.

74—Wellman gravelly silt loam. This very deep, well drained soil is on outwash terraces. It formed in loess and glacial outwash. Slope is 0 to 5 percent. The native vegetation is mainly conifers, shrubs, ferns, and grasses. Elevation is 150 to 200 feet. The average annual precipitation is 90 to 100 inches, the average annual air temperature is about 50 degrees F, and the average frost-free period is 160 to 190 days.

Typically, the surface layer is black and very dark brown gravelly silt loam 21 inches thick. The subsoil is dark yellowish brown extremely gravelly sandy loam 9 inches thick. The substratum to a depth of 60 inches or more is dark brown extremely gravelly sand. In some areas of similar included soils, the surface layer is gravelly loam.

Included in this unit are small areas of Solduc soils. Also included are small areas of Wellman soils that have slopes of more than 5 percent and soils that are somewhat excessively drained. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Wellman soil is moderate to the substratum and rapid through it. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight.

This unit is used as hayland, pastureland, homesites, and woodland.

If this unit is used for hay and pasture, the main limitation is the low available water capacity. Irrigation is

required for maximum production. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition.

This unit is suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 150, and on the basis of a 50-year site curve, the estimated mean site index is 115. Trees of limited extent are western redcedar and Sitka spruce. Among the common forest understory plants are western brackenfern, red huckleberry, salmonberry, vine maple, deer fern, Oregon oxalis, and western swordfern.

Seedling establishment is the main concern in the production of timber. Reforestation can be accomplished by planting western hemlock or Sitka spruce seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs readily. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings.

The main limitation for harvesting timber is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rounded gravel for road construction is readily available in areas of this unit.

This unit is well suited to homesite development. It has few limitations. Excavation for roads and buildings increases the risk of erosion. Cutbanks are not stable and are subject to caving in.

Use of the soil in this unit for septic tank absorption fields is limited by the rapid permeability of the substratum. The soil is a poor filter.

This map unit is in capability subclass IIIs, irrigated and nonirrigated.

75—Yeary gravelly loam, 0 to 15 percent slopes. This moderately deep, moderately well drained soil is on hills (fig. 7). It formed in reworked marine sediment and is underlain by dense, compact glacial till. The native vegetation is mainly conifers and shrubs. Elevation is 200 to 1,500 feet. The average annual precipitation is 20 to 35 inches, the average annual air temperature is about 49 degrees F, the average frost-free period is 160 to 200 days, and the average growing season (at 28 degrees) is 210 to 260 days.

Typically, the surface is covered with a mat of organic material 1.5 inches thick. The surface layer is dark brown gravelly loam 7 inches thick. The subsoil is yellowish brown gravelly loam and gravelly clay loam 31 inches thick. Dense, compact glacial till is at a depth of 38 inches. Depth to compact glacial till ranges from 20 to 40 inches. In some areas of similar included soils, the surface layer is gravelly silt loam or loam.

Included in this unit are small areas of Catla, Clallam, Hoypus, and McKenna soils. Also included are small areas of soils that are more than 40 inches deep to compact glacial till, Yeary soils that have slopes of more than 15 percent, and soils that are underlain by basalt or sandstone. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Yeary soil is moderately slow to the compact glacial till and very slow through it. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. Water is perched on the compact glacial till from January through April. The effects of the layer of compact glacial till on use and management is similar to that of a hardpan.

This unit is used mainly as woodland, hayland, and pastureland. It is also used as homesites.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 131, and on the basis of a 50-year site curve, the estimated mean site index is 98. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 70 is 132 cubic feet per acre per year. Trees of limited extent are grand fir, western redcedar, western hemlock, Pacific madrone, and bigleaf maple. Among the common forest understory plants are salal, oceanspray, red huckleberry, twinflower, Oregon-grape, blackberry, western swordfern, and western brackenfern. Floral use of salal and western swordfern is common on this unit.

The main limitation for harvesting timber is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in areas of this unit.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. The low precipitation during the growing season and the droughtiness of the surface layer contribute to seedling mortality. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Because the rooting depth is restricted by the compact glacial till, trees occasionally are subject to windthrow when the soil is wet and winds are strong.

If this unit is used for hay and pasture, the main limitation is steepness of slope. Irrigation is required for maximum production. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Use of equipment when the soil is wet results in compaction, which restricts penetration of moisture and roots. Proper stocking rates, pasture

Figure 7.—Glaciated landscape of Happy Valley, in an area of Yeary gravelly loam, 0 to 15 percent slopes, in the eastern part of Clallam County.

rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion.

If this unit is used for homesite development, the main limitation is wetness. Excavation for roads and buildings increases the risk of erosion.

Use of the soil in this unit for septic tank absorption fields is limited by wetness, depth to the compact glacial till, and restricted permeability. Because of the depth to glacial till, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Constructing septic tank absorption fields when the soil is wet results in reduced infiltration. Use of heavy equipment during construction compacts the soil and thus reduces permeability, particularly during periods when the soil moisture content is high. The steepness of slope is a concern when installing septic tank absorption fields. Absorption lines should be installed on the contour and should be designed so that effluent is evenly distributed throughout the absorption field.

This map unit is in capability subclass IIIe, irrigated and nonirrigated.

76—Yeary gravelly loam, 15 to 35 percent slopes. This moderately deep, moderately well drained soil is on hills. It formed in reworked marine sediment and is underlain by dense, compact glacial till. The native vegetation is mainly conifers and shrubs. Elevation is

200 to 1,500 feet. The average annual precipitation is 20 to 35 inches, the average annual air temperature is about 49 degrees F, the average frost-free period is 160 to 200 days, and the average growing season (at 28 degrees) is 210 to 260 days.

Typically, the surface is covered with a mat of organic material 1.5 inches thick. The surface layer is dark brown gravelly loam 7 inches thick. The subsoil is yellowish brown gravelly loam and gravelly clay loam 31 inches thick. Dense, compact glacial till is at a depth of 38 inches. Depth to compact glacial till ranges from 20 to 40 inches. In some areas of similar included soils, the surface layer is gravelly silt loam or loam.

Included in this unit are small areas of Clallam, Hoypus, and Louella soils. Also included are small areas of soils that are more than 40 inches deep to compact glacial till, Yeary soils that have slopes of less than 15 percent or more than 35 percent, and soils that are underlain by basalt or sandstone. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Yeary soil is moderately slow to the compact glacial till and very slow through it. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. Water is perched above the compact glacial till from January through April. The effect of the layer of compact glacial till on use and management is similar to that of a hardpan.

Most areas of this unit are used as woodland. A few areas are used as hayland, pastureland, and homesites.

This unit is suited to the production of Douglas-fir. On the basis of a 100-year site curve, the estimated mean site index for Douglas-fir is 131, and on the basis of a 50-year site curve, the estimated mean site index is 98. At the culmination of the mean annual increment (CMAI), the production of Douglas-fir at age 70 is 132 cubic feet per acre per year. Trees of limited extent are grand fir, western redcedar, western hemlock, Pacific madrone, and bigleaf maple. Among the common forest understory plants are salal, oceanspray, red huckleberry, twinflower, Oregon-grape, blackberry, western swordfern, and western brackenfern. Floral use of salal and western swordfern is common on this unit.

The main limitation for harvesting timber is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and compacts the soil. Unsurfaced roads and skid trails are soft when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Rock for road construction is not readily available in areas of this unit.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. Reforestation can be accomplished by planting Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs periodically. The low precipitation during the growing season and the droughtiness of the surface layer contribute to seedling mortality. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Because the rooting depth is restricted by the compact glacial till, trees occasionally are subject to windthrow when the soil is wet and winds are strong.

If this unit is used for hay and pasture, the main limitation is steepness of slope. Irrigation is required for maximum production. Seedbed preparation should be on the contour or across the slope where practical. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Use of equipment when the soil is wet results in compaction, which restricts penetration of moisture and roots Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion.

If this unit is used for homesite development, the main limitations are steepness of slope and wetness. Excavation for roads and buildings increases the risk of erosion. Buildings and roads should be designed to offset the limited ability of the soil in this unit to support a load.

Use of this unit for septic tank absorption fields is limited by steepness of slope, depth to the compact glacial till, and restricted permeability. Because of the depth to compact glacial till, onsite sewage disposal systems often fail or do not function properly during periods of high rainfall. Constructing septic tank absorption fields when the soil is wet results in reduced infiltration. Use of heavy equipment during construction compacts the soil and thus reduces permeability, particularly during periods when the soil moisture content is high. The steepness of slope is a concern when installing septic tank absorption fields. Absorption lines should be installed on the contour and should be designed so that effluent is evenly distributed throughout the absorption field.

This map unit is in capability subclasses IVe, irrigated, and IVe, nonirrigated.

77—Zeeka silt loam, 5 to 25 percent slopes. This moderately deep, somewhat poorly drained soil is on hills. It formed in loess and glacial till. The native vegetation is mainly conifers and shrubs. Elevation is 100 to 800 feet. The average annual precipitation is 80 to 100 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

Typically, the surface is covered with a mat of organic material 6 inches thick. The surface layer is very dark grayish brown and dark grayish brown silt loam 6 inches thick. The subsoil is dark brown, brown, and olive brown silt loam and gravelly silt loam 20 inches thick. Compact glacial till is at a depth of 26 inches. Depth to compact

glacial till ranges from 20 to 40 inches. In some areas of similar included soils, the surface layer is silt loam.

Included in this unit are small areas of Kydaka and Ozette soils. Also included are small areas of soils that are more than 40 inches deep to compact glacial till. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Zeeka soil is moderately slow to the compact glacial till and very slow through it. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is slight. Water is perched above the compact glacial till from November through April. The effect of the layer of compact glacial till on use and management is similar to that of a hardpan.

This unit is used as woodland.

This unit is suited to the production of western hemlock. On the basis of a 100-year site curve, the estimated mean site index for western hemlock is 123, and on the basis of a 50-year site curve, the estimated mean site index is 90. At the culmination of the mean annual increment (CMAI), the production of western hemlock at age 50 is 186 cubic feet per acre per year. Trees of limited extent include western redcedar and Pacific silver fir. Among the common forest understory plants are deer fern, red huckleberry, and salal.

The main limitation for harvesting timber is muddiness when the soil is wet. Use of wheeled and tracked equipment when the soil is wet produces ruts and displaces the soil. Using cable yarding systems and using equipment only during dry periods minimizes soil damage. Unsurfaced roads and skid trails are soft and sticky when wet, and they may be impassable during rainy periods. Logging roads require suitable surfacing for year-round use. Extra rock is needed as base material to maintain a suitable surface. Rock for road construction is not available in areas of this unit.

Seedling establishment and the hazard of windthrow are the main concerns in the production of timber. Reforestation can be accomplished by planting western hemlock seedlings. If seed trees are present, natural reforestation of cutover areas by western hemlock occurs periodically. When openings are made in the canopy, invading brushy plants can delay the establishment of seedlings. Western hemlock, a shallow rooted tree, is more commonly subject to windthrow than are more deeply rooted trees.

This map unit is in capability subclass IVe, nonirrigated.

Prime Farmland

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. It must either be used for producing food and fiber or be available for these uses. The land can be cropland, pastureland, rangeland, forest land, or other land, but it cannot be urban land, built-up land, or water.

Prime farmland has an adequate growing season and a moisture supply needed to economically produce high yields of adapted crops using modern and acceptable farming methods. Also, prime farmland has an adequate and dependable water supply from annual precipitation or irrigation, favorable temperatures during the growing season, and an acceptable level of acidity or alkalinity. It has few, if any rock fragments and is permeable to air and water. Prime farmland is not excessively erodible or saturated with water for long periods of time, and it is not frequently flooded.

Characteristics of soils that are desirable for farmland generally are the same characteristics that make soils suitable for use as homesites. Use of onsite waste treatment and disposal systems generally is limited to areas of soil that have adequate drainage, permeability, and slope. In many instances these soil characteristics coincide with those of prime farmland.

Historically, many population centers developed in areas suitable for farming. The town of Sequim is an example. It has an adequate supply of irrigation water and has soils suitable for farming, which led to the development of a prosperous farming area.

As the population of Clallam County increases, land use priorities will cause a gradual reduction in farmland acreage and an increase in urban and residential areas. This is apparent in the eastern part of the county.

This survey area has approximately 41,455 acres of prime farmland. Most of this acreage is on terraces along the Dungeness River in eastern Clallam County and on terraces of the Quillayute, Soleduck, Bogachiel, and Calawah Rivers in western Clallam County. Prime farmland soils in the western part of the survey area are subject to climatic limitations. This part of the area has more than 50 percent cloud cover during April through September; therefore, the limited amount of sunlight received may prevent profitable production of crops other than hay and pasture. Hay crops may not dry sufficiently. This includes about 22,876 acres or about 3.6 percent of the survey area. The soils in this part of the survey area are as follows.

22 Hoh silt loam
54 Queets silt loam
56 Quillayute silt loam, 0 to 5 percent slopes
74 Wellman gravelly silt loam

About 6,523 acres, or 1.0 percent, of the survey area meets the requirements for prime farmland, if drained. These soils are as follows.

4 Bellingham silty clay loam
38 Lummi silt loam
43 Mukilteo muck

About 12,056 acres, or 1.8 percent, of the survey area is soils that meet all the requirements for prime farmland.

1 Agnew silt loam, 0 to 8 percent slopes
9 Cassolary fine sandy loam, 0 to 8 percent slopes
17 Dungeness silt loam
53 Puget silt loam

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or forage plants best suited to the soils are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

In 1978 about 18,900 acres in the survey area was used as agricultural land. Of this total, about 9,760 acres was used as cropland, about 8,270 acres was used as permanent pastureland, and about 870 acres was intermittently farmed or idle. The total land in farms, including woodland, woodland pasture, homesites, roads, and ponds, was about 28,170 acres in 1978. Land used as cropland and pastureland has increased slightly from about 18,790 acres in 1974 to about 18,900 acres in 1978. Irrigated land has increased from about 7,750 acres in 1974 to about 8,720 acres in 1978. This indicates more intensive use of soils as cropland and pastureland. A continuing decrease in farmland, most evident in the Dungeness Valley, is expected as more land is used for urban and residential development. The use of this soil survey to help make land use decisions is discussed in the section, "General Soil Map Units."

The soils and climate of the survey area are well suited to the production of grass hay, alfalfa, oats, barley, peas, strawberries, and raspberries. Potatoes, field corn for silage, green peas, and lettuce are also grown. The cool growing season of this area may not permit field corn to mature.

Commercially grown specialty crops include cranberries, blueberries, and turfgrass. Crops grown for seed are turnips, cabbage, peas, carrots, beets, mustard, parsley, and spinach. Irrigation is needed for maximum crop production.

The soils in the eastern part of the survey area have fair suitability for increased production of crops. Most of the prime farmland in the Dungeness Valley is currently farmed. Increased use of land for such purposes as residential development is reducing the amount of land suitable for farming; however, crop production can be increased by applying the latest crop production technology to the available cropland. Evidence of applied improved technology and management is demonstrated by the increased production of hay crops. Although the total acreage used for hay crops decreased during the years of 1974 to 1978, hay production increased during this period.

Farmland with climatic limitations in the western part of the survey area have the greatest potential for

increased production of hay. Only a small acreage of the Hoh, Queets, Quillayute, and Wellman soils is currently farmed. Most of the acreage is forested. These soils are suitable for producing hay crops, but high average annual precipitation limits soil trafficability and the curing time for hay. Advances in crop production technology could reduce these problems, thus improving the farmland potential of these soils.

Water erosion is a hazard on most of the cropland and pastureland where slope is more than 2 percent. Agnew silt loam, 0 to 8 percent slopes, and Cassolary fine sandy loam, 0 to 8 percent slopes, are examples of soils that are subject to erosion.

The removal of the surface layer through water erosion reduces the available plant nutrients and the organic matter content of the soils. An adequate amount of organic matter has a positive effect on soil structure, water infiltration, available water capacity, and soil tilth. If the surface layer is removed, the upper part of the subsoil is incorporated into the plow layer. Soils that have a restrictive layer, such as a layer of very compact glacial till, should be protected against water erosion. The Clallam and Yeary soils are examples of such soils. Water erosion will also reduce productivity on droughty soils such as Dick loamy sand, 0 to 15 percent slopes. Improper irrigation can also cause severe water erosion. Good irrigation management is critical in the Dungeness Valley, where there is a high proportion of irrigated farmland.

Water erosion on farmland in some areas results in the pollution of streams with sediment, nutrients, and pesticides. Controlling water erosion minimizes such pollution and improves the quality of water available for municipal use, for recreation, and for fish and wildlife. Water erosion control practices that provide protective plant cover reduce runoff and increase the water intake rate. A cropping system that keeps plant cover on the soil surface for extended periods reduces water erosion and preserves the productive capacity of the soils. Use of grass and legume forage crops in the cropping system reduces water erosion, provides nitrogen to plants, and improves soil tilth.

Minimum tillage, and in some areas terraces and diversions, helps to control water erosion on cropland and pastureland. The soils in this survey area generally are not suitable for terracing, contour farming, and constructing diversions because of short, irregular slopes, excessive wetness in the terrace channels, or very compact glacial till at a depth of less than 40 inches. On the soils that have these characteristics, such as the Agnew, Clallam, McKenna, and Yeary soils, a cropping system that provides abundant plant cover helps to control water erosion. Leaving crop residue on the surface by practicing minimum tillage increases the water intake rate, reduces surface runoff, and reduces water erosion. It also reduces water erosion during seeding and early crop growth.

Soil drainage is needed on some farmable soils in the survey area. Unless artificially drained, these soils are so wet that the production of crops common to the area generally is not feasible. These poorly drained and very poorly drained soils are the Bellingham, Lummi, McKenna, and Mukilteo soils, of which there is 8,270 acres in the survey area. If drainage is not applied on the somewhat poorly drained soils in the area, crops may be damaged in most years. Examples of such soils are the Agnew and Casey soils.

The Carlsborg, Dick, Dungeness, Hoh, Queets, Quillayute, Sequim, and Wellman soils are somewhat excessively drained or well drained.

The preferred design of both surface and subsurface drainage systems varies with the kind of soil. A combined surface and subsurface system is desirable in most areas of poorly drained and very poorly drained soils. Drains need to be spaced closer together on slowly permeable soils than on more rapidly permeable soils. Adequate outlets for drainage systems are difficult to locate in many areas of Agnew, Bellingham, Lummi, McKenna, Mukilteo, and Puget soils.

Draining organic soils can cause them to oxidize and subside. Special drainage systems are needed to control the depth and the time period of drainage. Keeping the water table at the proper level for crops during the growing season and raising it to the surface during other parts of the year minimize the oxidation and subsidence of these organic soils. When drained, and unless limed, the organic soils are very strongly acid to strongly acid. These soils require special fertilizers to add the trace elements. An example is the Mukilteo soils.

Soil fertility is low in most soils on hills in the survey area. The reaction of most of these soils is acid. The reaction of soils on terraces, flood plains, and alluvial fans range from medium acid to neutral. The soils in these areas are higher in content of plant nutrients than are most soils on hills and foothills.

Many of the soils in the area are medium acid or strongly acid. If these soils have never been limed, applications of ground limestone may be needed to increase the reaction sufficiently for good growth of alfalfa and other crops that grow best on neutral soils. Available phosphorus and potash levels are low in most of these soils. Additions of lime and fertilizer should be based on the results of soil tests, on the need of the crop grown, and on the expected level of yields.

Soil tilth is an important factor in the germination of seeds and in the infiltration of air and water into the soil. Soils that have good tilth have a silt loam or loam surface layer, a moderate content of organic matter, and granular structure.

Plowing the cropland early in spring and overusing wheeled equipment on soils that have low organic matter content, tends to degrade the granular structure to an undesirable platy or massive structure. Regular additions of crop residue, manure, and other organic material can

improve soil structure, increase the water intake rate, reduce surface crusting, reduce soil losses from water erosion, and promote good tilth. Organic matter is also an important source of nitrogen for crops.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (*34*). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed Soil Map Units."

Woodland Management and Productivity

By Dennis Robinson, area forester, Soil Conservation Service

The survey area is distinguished by several forest zone types. The western part of the area is characterized by

dense stands of Sitka spruce, western hemlock, and western redcedar. The soils in this part of the area are among the most productive in the world (*21*). Western hemlock (*4*), Douglas-fir, and red alder stands are dominant in a major part of the rest of the area (*19*).

A large part of the forest land in the survey area is in public ownership. Large private forest industry ownerships constitute about 22 percent of the area; the majority of this ownership is concentrated in the western part of Clallam County. Approximately 106,000 acres, or 11 percent of the forest acreage in the survey area, is in nonindustrial private forest ownerships (*6*).

Soils vary in their ability to produce trees. Depth, fertility, texture, and available water capacity influence tree growth (*22*). Elevation, aspect, and climate determine the kinds of trees that can be expected to grow on any site. The Olympic Mountains have strongly influenced the precipitation patterns in the survey area. Woodland productivity is best in the western coastal areas and decreases to the east where the "rain shadow" effect in the Sequim area is pronounced.

Woodland management intensity varies with the type of ownership and site productivity. Several large private forest industry owners have significantly increased the level of their woodland management. Nonindustrial private forest land owners as a group have not yet engaged in management at this same level of intensity; however, management is improving as a result of cooperative efforts on the part of public and private agencies to sponsor conservation programs, provide better marketing opportunities, and increase awareness of woodland management opportunities.

Seedling establishment is the main concern in the production of timber on all soils in the survey area. Occupation of sites following harvesting by brush species is a significant problem at elevations below 1,500 feet.

The main limitations to the harvesting of timber is steepness of slope and seasonal soil wetness because of heavy rainfall. All landowners and users use a variety of harvesting equipment. Use of ground equipment on slopes steeper than 30 percent generally is considered to be hazardous for the equipment operator; high-lead cable systems that lift logs clear of the soil surface are safer and damage the soil less.

Ten softwood sawmills in the survey area process a full range of conifer species with outputs exceeding 50,000 board feet, per day, per shift (*7*). There are about 65 shake and shingle mills in the area, the majority of which are in the Forks area.

Soil surveys are becoming more important to forest managers as they seek ways of increasing the productivity of their forested lands. Certain soils will respond better to fertilization, some are more susceptible to landslides and erosion after roadbuilding and harvesting, and others will require special effort to harvest and reforest. Detailed information on woodland management is given for each map unit in the section "Detailed Soil Map Units."

Each map unit suitable for producing wood crops has information concerning forest productivity, limitations for harvesting timber, concerns for producing timber, and common forest understory plants. The methods and procedures used by foresters and soil scientists to develop the information for each map unit are contained in the Soil Conservation Service National Forestry Manual and the State of Washington Forest Land Grading Procedures Handbook.

Table 6 summarizes forestry in formation given in the soil map units and can serve as a quick reference for important forestry interpretations. *Map unit symbols* are listed, and the *ordination (woodland suitability) symbol* for each is given. All soils having the same ordination symbol require the same general kinds of forest management and have about the same potential productivity.

The ordination symbol is based on a uniform system of labeling individual soils to determine the productivity potential and the principal soil properties in relation to any hazards or limitations of the soils. The first element of the ordination symbol is a number that denotes potential productivity in terms of cubic meters of wood per hectare per year for the indicator tree species (that species listed first in the soil map unit and in table 6 for a particular map unit). Potential productivity is based on site index and the corresponding culmination of mean annual increment. For example, a number *1* would mean the soil has the potential to produce 1 cubic meter of wood per hectare per year (14.3 cubic feet per acre per year, or about 70 board feet per acre per year) and *10* would mean the soil has potential for producing 10 cubic meters of wood per hectare per year (143 cubic feet per acre per year, or about 700 board feet per acre per year). The second element of the symbol, a letter, indicates the major kind of soil characteristic that limits tree growth or management. The letter *R* indicates restrictions because of relief or steepness of slope; *X*, stones or rocks; *W*, excessive water, either seasonally or year round, in or on the soil; *T*, toxic substances within the rooting zone; *D*, restricted rooting depth; *C*, clayey texture; *S*, sandy texture; and *F*, fragmented or skeletal soils with coarse fragments that are more than 2 millimeters and less than 10 inches in diameter. The letter *A* indicates slight or no limitations for forest land use or management. If a soil has more than one limitation, the letter denoting the most limiting characteristic is used.

In table 6 the soils are also rated for a number of factors to be considered in management. *Slight*, *moderate*, and *severe* are used to indicate the degree of major soil limitations. For each moderate or severe rating, a sentence in the applicable soil map unit explains the soil factor or factors that are the basis of that rating.

Equipment limitation ratings refer to the limits on the use of equipment, year round or seasonally, as a result of soil characteristics. A rating of *slight* indicates that equipment use is not normally restricted in kind or time of year because of soil factors; *moderate* indicates a short seasonal limitation because of wetness, a fluctuating water table, or some other factor; and *severe* indicates a seasonal limitation, a need for special equipment, such as one of the cable-yarding logging systems, or a hazard in the use of equipment. Steepness of slope and soil wetness are the main factors that cause equipment limitations. As slope gradient and length increase, it becomes more difficult to use wheeled equipment. On yet steeper slopes, tracked equipment must be used. On the steepest slopes, even tracked equipment cannot operate safely and more sophisticated systems must be used. Soil wetness, especially in combination with fine texture, can severely limit the use of equipment, making harvesting practical only during dry summer months.

Seedling mortality ratings refer to the probability of death of naturally occurring or planted tree seedlings as influenced by kinds of soil or topographic conditions. Plant competition is not considered in the ratings. The ratings apply to healthy, dormant seedlings from good stock that are properly planted or to naturally established seedlings that germinate during a period of sufficient soil moisture. *Slight* indicates that no problem is expected under usual conditions; *moderate* indicates that some problems of mortality can be expected and that extra precautions are advisable; and *severe* indicates that mortality will be high and that extra precautions are essential for successful reforestation. Soil wetness, droughtiness of the surface layer (especially on south- or southwest-facing slopes), or exposed ridgetop locations account for seedling mortality problems. To offset these, larger than usual planting stock, special site preparation, surface drainage, or reinforcement planting may be needed.

Ratings of *windthrow hazard* consider the soil characteristics that affect the development of tree roots and the ability of soils to hold trees firmly. A rating of *slight* indicates that trees are not normally blown down by wind; strong winds may break trees but not uproot them; *moderate* indicates that an occasional tree may be blown down during periods of excessive wetness combined with moderate or strong winds; and *severe* indicates that many trees can be expected to be blown down during periods when the soil is wet and winds are moderate or strong. Restricted rooting depth because of a high water table, or depth to bedrock, or an impervious layer or because of poor anchoring of roots as a result of a loose surface layer and subsoil is responsible for windthrow or tree tipover. Moderate and severe ratings indicate the need for more care in thinning the edges of woodland stands, a plan calling for periodic salvage of windthrown trees, and an adequate road and trail system to allow for salvage operations.

Plant competition ratings refer to the likelihood of the invasion or growth of undesirable brushy plants when openings are made in the tree canopy. A *slight* rating indicates that unwanted brushy plants are not likely to delay natural reforestation and that planted seedlings have good prospects for development without undue competition; *moderate* indicates that competition will delay natural or planted reforestation; *severe* indicates that competition can be expected to prevent natural or planted reforestation. Favorable climate and soil characteristics account for plant competition problems. In many instances, the key to predicting brush competition problems is the quantity and proximity of seed sources of undesirable plants or the quantity of unwanted brush rootstocks that will resprout after harvest activities. Moderate and severe ratings indicate the need for careful and thorough postharvest cleanup in preparation for reforestation and the possibility of mechanically or chemically treating brush to retard its growth and allow seedlings to develop.

The potential productivity of important trees on a soil is expressed as a *site index*. This index is determined by taking height and age measurements of selected trees within stands of a given species. The procedure and technique for doing this are given in the site index publications used for the soil survey area (*5, 23, 26, 37, 39*). The site index applies to fully stocked, even-aged, unmanaged stands growing on a particular soil map unit. The greatest timber yields, usually expressed in board feet or cubic feet per acre, can be expected from map units with the highest site indexes. Site index values can be converted into estimated yields at various ages by carefully using the appropriate "yield" publications (*5, 9, 10, 11, 12, 13, 26, 38, 39*). *Common trees* are listed in the same order as that of their general occurrence observed on the map unit. Generally, only one or two species are dominant.

Trees to plant are those that are planted for reforestation or, if suitable conditions exist, allowed to naturally regenerate. Species listed are suited to the soils and will produce a commercial wood crop. Desired product, topographic position (such as a ridgetop), and personal preference are three factors of many that can influence the choice of adapted trees to use for reforestation.

Woodland Understory Vegetation

The climate and soils of the survey area produce a variety of forest understory vegetation. This vegetation mainly consists of shrubs and forbs with some grasses. Understory plants that typically are in a map unit are listed in the applicable map unit description in the section "Detailed Soil Map Units."

Some soils in the eastern part of the survey area produce a sufficient quality and quantity of evergreen huckleberry, salal, and western swordfern suitable for use by the floral greenery industry. The quality and quantity of these species vary with the kind of soil, the depth and condition of the duff and litter, the age and kind of trees in the canopy, past disturbance, and the density of the canopy. Figure 8 shows the potential for producing floral greenery on the soils in the survey area that are suitable for this use. Ratings are based on information from field plots that were used for determining timber production potential. A rating of *excellent* indicates that the applicable species typically makes up more than 20 percent of the ground cover, a rating of *good* indicates that the applicable species makes up 10 to 20 percent of the ground cover, a rating of *fair* indicates that the applicable species makes up 2 to 9 percent of the ground cover, and a rating of *poor* indicates that the species is not commonly found in quality or quantity adequate for use as floral greenery.

Map Symbol	Soil name	Potential for producing--		
		Evergreen huckleberry	Salal	Western swordfern
10	Catla gravelly sandy loam, 2 to 15 percent slopes	Poor	Good	Poor
11	Catla-Hoypus complex, 2 to 65 percent slopes	Poor	Good	Poor
12	Clallam gravelly sandy loam, 0 to 15 percent slopes	Fair	Good	Poor
13	Clallam gravelly sandy loam, 15 to 30 percent slopes	Fair	Excellent	Poor
16	Dick loamy sand, 0 to 15 percent slopes	Poor	Good	Good
20	Elwha gravelly sandy loam, 0 to 15 percent slopes	Poor	Excellent	Excellent
21	Elwha gravelly sandy loam, 15 to 35 percent slopes	Poor	Good	Poor
23	Hoypus gravelly sandy loam, 0 to 15 percent slopes	Poor	Good	Fair
24	Hoypus gravelly sandy loam, 15 to 30 percent slopes	Poor	Fair	Poor
45	Neilton very gravelly sandy loam, 5 to 30 percent slopes	Poor	Fair	Poor
46	Neilton very cobbly sandy loam, 0 to 5 percent slopes	Fair	Good	Poor
58	Sadie gravelly loam, 0 to 35 percent slopes	Poor	Fair	Fair
59	Schnorbush loam, 0 to 20 percent slopes	Poor	Fair	Fair
75	Yeary gravelly loam, 0 to 15 percent slopes	Poor	Good	Fair
76	Yeary gravelly loam, 15 to 35 percent slopes	Poor	Fair	Fair

Figure 8.—Potential for producing floral greenery on the soils in the survey area that are suitable for this use.

Recreation

The soils of the survey area are rated in table 7 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 7, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 7 can be supplemented by other information in this survey; for example, interpretations for dwellings without basements and for local roads and streets in table 10 and interpretations for septic tank absorption fields in table 11.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Steep slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife Habitat

By Ivan L. Lines, Jr., biologist, Soil Conservation Service

This survey area supports many kinds of wildlife habitat ranging from that of intertidal zones to that of farmland and mountainous forest land. Saltwater fish, freshwater fish, shellfish, birds, large mammals, and small mammals are common in their respective habitats. Logging, farming, urbanization, and other activities have modified habitats and population densities of many native animals.

Clams, oysters, mussels, crabs, and numerous other invertebrates inhabit the extensive beaches and tidelands in the survey area. Intertidal zones serve as important spawning and rearing areas for several game fish and nongame fish, many of which are prey of game fish.

Numerous waterfowl frequent coastal areas as well as freshwater and brackish wetlands, ponds, and streams. Plovers, sandpipers, and other shore birds as well as gulls, terns, and cormorants are abundant along the Strait of Juan de Fuca. Peal's peregrine falcons also inhabit steep bluffs and cliffs in coastal areas. Chinook, coho, pink salmon, and chum salmon and various species of bottom fish support a valuable sport and commercial fishery. Rivers and streams are used as spawning and rearing areas for salmon, steelhead, sea-run cutthroat, Dolly Varden, and nonmigratory trout. Although several runs have been severely reduced or eliminated, many streams still produce average or above average numbers of fish. Bald eagles and osprey are frequently seen along these spawning streams. Hatcheries on the Dungeness, Elwha, and Soleduck Rivers supplement the natural production of fish.

Lowlands, mainly those in general soil map units 1 to 7, include a mixture of farmland and woodland dissected by numerous stream corridors. Common kinds of wildlife in these areas are skunks, raccoons, coyotes, bobcats, rabbits, band-tailed pigeon, mourning dove, California quail, pheasants, hawks, owls, and numerous nongame birds. Black-tailed deer are extremely adaptable and tolerant of human disturbance. They are common in both farmed and forested areas. Black bear and cougar, on the other hand, are seen with less frequency in lowland areas.

Forested upland areas provide habitat for Roosevelt elk, black-tailed deer, black bear, cougar, band-tailed pigeon, fisher, marten, ruffed grouse, and blue grouse and for numerous other nongame birds and small mammals. Logging and associated roadbuilding activities have modified both forested and aquatic ecosystems. Logging removes habitat for species dependent on old growth. At the same time, the regrowth of grasses, forbs, and shrubs provides good feeding areas for deer and elk. Adverse effects of logging can be minimized by harvesting in small, irregularly shaped clearcuts, maintaining snags, closing unneeded roads, leaving unharvested buffer strips along streams, and preventing accelerated sedimentation of streams, lakes, and wetlands.

Wildlife habitat can be improved in many areas by managing food, water, and cover. Areas best suited for intensive improvement are in general soil map units 1 to 5. Most habitat management in general soil map units 5 to 11 will result from considering wildlife needs when managing woodlands.

Some of the soils in this survey area are used as irrigated cropland, nonirrigated cropland, irrigated hay or pastureland, or woodland, or as all of these. If any areas of a given soil are irrigated, the ratings for the soil given in table 8 are those applicable to irrigated land. Otherwise, the soil is rated as nonirrigated. Refer to the appropriate map unit in the section "Detailed Soil Map Units" to determine if some areas of a soil are irrigated.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 8, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, western brackenfern, western swordfern, lupine, thistle, and dandelion.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are red alder, cottonwood, vine maple, and dogwood.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are Douglas-fir, Sitka spruce, and western redcedar.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are salmonberry, Oregon-grape, salal, huckleberry, and elderberry.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are

texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, saltgrass, rushes, sedges, and cattail.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include California quail, pheasant, meadowlark, robin, crow, killdeer, and rabbit.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, band-tailed pigeons, woodpeckers, squirrels, black-tailed deer, black bear, and Roosevelt elk.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, kingfishers, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, and natural soil structure aggregation. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 9 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 10 shows the degree and the kind of soil limitations that affect tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 10 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The

ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage because of rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 11 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 11, only

the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 12 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, and terraces and diversions.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to

a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution (*34*).

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 13 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have a layer of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 14 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

No clay percentage values are given for soils that formed in material high in content of volcanic ash. The textures specified are apparent field textures. Because of the influence of volcanic ash, a complete clay dispersion is not obtained in the laboratory and clay values reported are low. The measured physical and chemical properties for these kinds of soils indicate a much higher clay content than is reported by the laboratories.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, more than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (up to 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water. Rock fragments in the soil reduce the K value; therefore, the K values expressed in table 14 reflect the amount of rock fragments in the soil.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 14, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Tables 15 and 16 give estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 15 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 15 are the depth to the seasonal high water table; the kind of water table; that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in the table.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Table 16 gives various soil features.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Cemented pans are cemented or indurated subsurface layers within a depth of 5 feet. Such pans cause difficulty in excavation. Pans are classified as thin or thick. A *thin* pan is less than 3 inches thick if continuously indurated or less than 18 inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. A *thick* pan is more than 3 inches thick if continuously indurated or more than 18 inches thick if discontinuous or fractured. Such a pan is so thick or massive that blasting or special equipment is needed in excavation. Some soils in this survey area are underlain by dense, compact glacial till. These soils are identified in the detailed map unit descriptions, general soil map unit descriptions, and series descriptions as

having dense glacial till layers; however, in the interpretation tables they are identified as having cemented pans. For most soil interpretations, the dense glacial till is the same as a cemented pan.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*36*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 17 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Inceptisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ochrept (*Ochr*, meaning pale, plus *ept*, from Inceptisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Xerochrepts (*Xer*, meaning dry, plus *ochrept*, the suborder of the Inceptisols that have xeric moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Xerochrepts.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is coarse-loamy, mixed, mesic Typic Xerochrepts.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*33*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*36*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Agnew Series

The Agnew series consists of very deep, somewhat poorly drained soils on terraces. These soils formed in glaciomarine sediment. Slope is 0 to 8 percent. Elevation is 50 to 400 feet. The average annual precipitation is about 15 to 25 inches, the average annual air temperature is about 49 degrees F, and the average frost-free season is 170 to 200 days.

These soils are fine-loamy, mixed, mesic Aquic Haploxeralfs.

Typical pedon of Agnew silt loam, 0 to 8 percent slopes, about 3 miles north and 6 miles west of Sequim,

500 feet south and 1,000 feet west of the northeast corner of sec. 7, T. 30 N., R. 4 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine and very fine subangular blocky structure; slightly hard, friable, sticky and plastic; many fine and very fine roots; many fine and very fine irregular and tubular pores; slightly acid; clear smooth boundary.

Bt1—8 to 18 inches; yellowish brown (10YR 5/4) silty clay loam, light gray (2.5Y 7/2) dry; common medium distinct dark yellowish brown (10YR 4/4) mottles; light yellowish brown (10YR 6/4) dry; moderate fine and medium angular blocky structure; very hard, firm, very sticky and very plastic; many fine and very fine roots; many fine and very fine irregular pores and common fine and very fine tubular pores; common thick clay films in pores and on faces of peds; slightly acid; clear smooth boundary.

Bt2—18 to 28 inches; dark yellowish brown (10YR 4/4) clay loam, light yellowish brown (10YR 6/4) dry; many medium distinct light brownish gray (2.5Y 6/2) and pale brown (10YR 6/3) mottles, light gray (2.5Y 7/2) dry; moderate fine and medium angular blocky structure; very hard, firm, very sticky and very plastic; common fine and very fine roots; many fine and very fine irregular pores and common fine and very fine tubular pores; common moderately thick clay films in pores and on faces of peds; slightly acid; gradual smooth boundary.

Bt3—28 to 35 inches; yellowish brown (10YR 5/4) clay loam, light yellowish brown (10YR 6/4) dry; many medium distinct light brownish gray (2.5Y 6/2) and pale brown (10YR 6/3) mottles, light gray (2.5Y 7/2) dry; moderate fine and medium angular blocky structure; very hard, firm, sticky and very plastic; common fine and very fine roots; common fine and very fine irregular and tubular pores; common moderately thick clay films in pores and on faces of peds; medium acid; clear wavy boundary.

BCt—35 to 46 inches; light olive brown (2.5Y 5/4) silty clay loam, light yellowish brown (2.5Y 6/4) dry; many medium distinct light brownish gray (2.5Y 6/2) and pale brown (10YR 6/3) mottles, light gray (2.5Y 7/2) dry; weak fine and medium angular blocky structure; very hard, firm, very sticky and very plastic; few fine and very fine roots; common fine and very fine tubular pores and few very fine irregular pores; common moderately thick clay films in pores; medium acid; clear smooth boundary.

C—46 to 60 inches; olive brown (2.5Y 4/4), stratified silty clay loam, silt loam, and sandy loam, pale yellow (2.5Y 7/4) dry; common medium distinct light brownish gray (2.5Y 6/2) and pale brown (10YR 6/3) mottles, light gray (2.5Y 7/2) dry; massive; slightly hard to very hard, friable to firm, slightly sticky to sticky and slightly plastic to plastic; few fine and very fine roots; common fine and very fine tubular pores; medium acid.

The A horizon has value of 3 to 5 when moist and 6 or 7 when dry. It is slightly acid or medium acid.

The Bt horizon has value of 4 to 6 when moist and 6 or 7 when dry, and it has chroma of 3 or 4 when moist and 2 to 4 when dry. It is silt loam, silty clay loam, or clay loam. It is slightly acid or medium acid.

The C horizon has hue of 10YR, 2.5Y, or 5Y when moist or dry, value of 4 or 5 when moist and 6 or 7 when dry, and chroma of 2 to 4 when moist or dry. It is dominantly silt loam and silty clay loam but has thin layers of sandy loam, loamy sand, and loam. It is medium acid to neutral.

Bellingham Series

The Bellingham series consists of very deep, poorly drained soils in basins and on low terraces. These soils formed in alluvium. Slope is 0 to 3 percent. Elevation is 20 to 600 feet. The average annual precipitation is about 35 to 60 inches, the average annual air temperature is about 50 degrees F, and the average frost-free season is 170 to 200 days.

These soils are fine, mixed, nonacid, mesic Mollic Haplaquepts.

Typical pedon of Bellingham silty clay loam, about 0.5 mile north of Joyce, 400 feet south and 1,300 feet east of the northwest corner of sec. 32, T. 31 N., R. 8 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, dark grayish brown (10YR 4/2) dry; common fine distinct strong brown (7.5YR 4/6) mottles, reddish yellow (7.5YR 6/6) dry; moderate fine and very fine granular structure and moderate fine and very fine subangular blocky; hard, friable, sticky and plastic; many fine and very fine roots; many very fine irregular and tubular pores; medium acid; clear smooth boundary.

Bg1—9 to 23 inches; dark gray (5Y 4/1) silty clay loam, light olive gray (5Y 6/2) dry; common medium prominent yellowish red (5YR 5/8) mottles, reddish yellow (5YR 7/8) dry; moderate coarse and medium angular blocky structure; very hard, firm, very sticky and very plastic; common fine and very fine roots; few very fine irregular pores and common very fine tubular pores; slightly acid; gradual smooth boundary.

Bg2—23 to 43 inches; olive gray (5Y 4/2) silty clay loam, gray (5Y 6/1) dry; many medium prominent yellowish red (5YR 5/8) mottles, reddish yellow (5YR 6/8) dry; moderate medium and fine angular blocky structure; hard, friable, sticky and plastic; few fine and very fine roots; common very fine irregular

and tubular pores; 1 percent pebbles; slightly acid; abrupt smooth boundary.

C1g—43 to 50 inches; very dark gray (5Y 3/1) silty clay loam, dark gray (5Y 4/1) dry; common fine prominent yellowish red (5YR 4/6) mottles, reddish yellow (5YR 6/6) dry; massive; very hard, firm, very sticky and very plastic; few very fine roots; few very fine irregular and tubular pores; slightly acid; abrupt smooth boundary.

C2g—50 to 60 inches; gray (5Y 6/1) silty clay loam, light gray (5Y 7/1) dry; common medium prominent strong brown (7.5YR 4/6) mottles, reddish yellow (7.5YR 6/6) dry; massive; very hard, firm, sticky and plastic; few very fine roots; few very fine irregular and tubular pores; 5 percent pebbles; neutral.

The A horizon has value of 2 or 3 when moist, and it has chroma of 1 or 2 when dry. It is slightly acid or medium acid.

The Bg horizon has hue of 2.5Y or 5Y, value of 4 or 5 when moist and 6 or 7 when dry, and chroma of 1 or 2 when dry. It has few to many, fine and medium, yellowish red, strong brown, yellowish brown, or dark yellowish brown mottles. The horizon is silty clay loam or silty clay and is neutral or slightly acid.

The C horizon has hue of 5Y or 5B when dry, value of 6 or 7 when dry, and chroma of 1 or 2 when moist or dry. It has common to many, fine and medium, yellowish red or strong brown mottles. The horizon is silty clay loam or silty clay and is neutral or slightly acid.

Calawah Series

The Calawah series consists of very deep, well drained soils on terraces. These soils formed in loess and old alluvium over glacial outwash. Slope is 0 to 15 percent. Elevation is 100 to 1,200 feet. The average annual precipitation is about 80 to 130 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

These soils are medial, mesic Typic Dystrandepts.

Typical pedon of Calawah silt loam, 0 to 15 percent slopes, about 4 miles south and 3 miles east of Forks, 2,500 feet north and 2,000 feet west of the southeast corner of sec. 36, T. 28 N., R. 13 W.

Oi—2 inches to 0; needles, leaves, and twigs.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, dark brown (10YR 4/3) dry; weak very fine and fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; weakly smeary; many very fine, fine, and medium roots; many very fine and fine irregular pores; trace of pebbles; very strongly acid; clear smooth boundary.

A2—4 to 10 inches; dark brown (10YR 3/3) silt loam, brown (10YR 4/3) dry; weak very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; weakly smeary; many very fine and fine roots and common medium roots; many very fine irregular pores and many very fine and fine tubular pores; very strongly acid; clear smooth boundary.

AB—10 to 18 inches; dark brown (10YR 3/3) silty clay loam, yellowish brown (10YR 5/4) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; many very fine and fine roots and common medium roots; many very fine irregular pores and many very fine and fine tubular pores; strongly acid; clear smooth boundary.

Bw1—18 to 30 inches; dark yellowish brown (10YR 4/4) silty clay loam, light yellowish brown (10YR 6/4) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; common very fine and fine roots and few medium roots; many very fine irregular pores and many very fine and fine tubular pores; strongly acid; clear smooth boundary.

Bw2—30 to 46 inches; yellowish brown (10YR 5/6) silty clay loam, very pale brown (10YR 7/4) dry; moderate very fine and fine angular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; few very fine, fine, and medium roots; many very fine irregular and tubular pores; 1 percent pebbles; strongly acid; gradual smooth boundary.

2Bw3—46 to 60 inches; yellowish brown (10YR 5/6) gravelly silty clay loam, very pale brown (10YR 7/4) dry; moderate very fine and fine angular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; few very fine and fine roots; many very fine irregular and tubular pores; 15 percent pebbles and 5 percent cobbles; strongly acid.

The umbric epipedon is 10 to 20 inches thick. The profile is strongly acid or very strongly acid.

The A horizon has value of 2 or 3 when moist and 3 to 5 when dry, and it has chroma of 2 to 4 when dry.

The Bw horizon has hue of 10YR or 2.5Y, value of 3 to 6 when moist and 5 to 8 when dry, and chroma of 3 to 6 when moist and 3 or 4 when dry. It is silt loam or silty clay loam.

The 2Bw horizon is gravelly silt loam or gravelly silty clay loam at a depth of more than 60 inches in some pedons. In some pedons few fine distinct mottles are in the lower part of the horizon.

Carlsborg Series

The Carlsborg series consists of very deep, somewhat excessively drained soils on river terraces and alluvial fans. These soils formed in alluvium. Slope is 0 to 5 percent. Elevation is 50 to 500 feet. The average annual precipitation is about 15 to 32 inches, the average

annual air temperature is about 49 degrees F, and the average frost-free season is 170 to 200 days.

These soils are sandy-skeletal, mixed, mesic Typic Xerorthents.

Typical pedon of Carlsborg gravelly sandy loam, 0 to 5 percent slopes, near the western boundary of Sequim, along U.S. Highway 101; about 2,500 feet south and 850 feet east of the northwest corner of sec. 19, T. 30 N., R. 3 W.

Ap—0 to 9 inches; dark brown (7.5YR 4/4) gravelly sandy loam, light brown (7.5YR 6/4) dry; weak fine and very fine subangular blocky structure parting to granular; very friable, slightly sticky and nonplastic; many fine and very fine roots; many fine and very fine irregular pores and many very fine tubular pores; 30 percent pebbles; slightly acid; clear smooth boundary.

Bw—9 to 20 inches; dark brown (7.5YR 4/4) very gravelly loamy sand, light brown (7.5YR 6/4) dry; weak fine and very fine subangular blocky structure; very friable, nonsticky and nonplastic; common fine and very fine roots; many fine and very fine irregular pores and many very fine tubular pores; 40 percent pebbles and 15 percent cobbles; slightly acid; gradual smooth boundary.

C1—20 to 37 inches; dark yellowish brown (10YR 4/4) extremely gravelly loamy sand, light yellowish brown (10YR 6/4) dry; massive; very friable, nonsticky and nonplastic; common fine and very fine roots; many fine and very fine irregular pores; 45 percent pebbles and 20 percent cobbles; slightly acid; clear smooth boundary.

C2—37 to 45 inches; yellowish brown (10YR 5/4) extremely cobbly loamy sand, very pale brown (10YR 7/4) dry; single grain; loose; few fine and very fine roots; 45 percent pebbles and 30 percent cobbles; slightly acid; clear smooth boundary.

C3—45 to 60 inches; yellowish brown (10YR 5/4) extremely gravelly sand, light yellowish brown (10YR 6/4) dry; single grain; loose; few fine and very fine roots; 40 percent pebbles and 20 percent cobbles; slightly acid.

The control section is 60 to 85 percent pebbles and cobbles.

The A horizon has value of 3 or 4 when moist and 4 to 6 when dry, and it has chroma of 2 to 4 when moist.

The Bw horizon has value of 5 or 6 when dry. It is very gravelly loamy sand or very cobbly loamy sand.

The C horizon has value of 3 to 5 when moist and 5 to 7 when dry. It is extremely cobbly loamy sand, extremely gravelly sand, or extremely gravelly loamy sand.

Casey Series

The Casey series consists of very deep, somewhat poorly drained soils on terraces. These soils formed in stratified glaciolacustrine or marine sediment. Slope is 0 to 10 percent. Elevation is 200 to 600 feet. The average annual precipitation is about 30 to 50 inches, and the average annual air temperature is about 49 degrees F. The average frost-free season is 160 to 200 days, and the average growing season (at 28 degrees) is 230 to 260 days.

These soils are fine, mixed, mesic Aquic Haploxeralfs.

Typical pedon of Casey silty clay loam, 0 to 10 percent slopes, about 9 miles southwest of Port Angeles, 2,200 feet north and 800 feet west of the southeast corner of sec. 32, T. 30 N., R. 7 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium and fine subangular blocky structure; slightly hard, friable, sticky and plastic; many fine and very fine roots; strongly acid; abrupt smooth boundary.

Btg1—8 to 18 inches; grayish brown (10YR 5/2) silty clay, light gray (10YR 7/1) dry; common medium prominent yellowish brown (10YR 5/6) mottles, yellowish brown (10YR 5/8) dry; moderate coarse and medium angular blocky structure; very hard, firm, very sticky and very plastic; many fine and very fine roots; common very fine irregular pores and many very fine tubular pores; common moderately thick clay films in pores and on ped faces; medium acid; gradual smooth boundary.

Btg2—18 to 29 inches; dark gray (5Y 4/1) silty clay, gray (5Y 6/1) dry; common medium prominent dark yellowish brown (10YR 4/6) mottles, brownish yellow (10YR 6/6) dry; moderate coarse and medium angular blocky structure; very hard, firm, very sticky and very plastic; common very fine roots; common very fine irregular and tubular pores; many moderately thick clay films in pores and on ped faces; slightly acid; clear smooth boundary.

BCtg—29 to 36 inches; olive gray (5Y 5/2) silty clay, light gray (5Y 7/1) dry; common medium prominent dark yellowish brown (10YR 4/6) mottles, brownish yellow (10YR 6/6) dry; weak coarse and medium angular blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; few very fine irregular and tubular pores; common moderately thick clay films in pores; slightly acid; clear smooth boundary.

C—36 to 60 inches; olive (5Y 5/3) silty clay loam, light gray (5Y 7/2) dry; massive; very hard, very firm, very sticky and very plastic; few very fine roots; few very fine irregular pores; few thin strata of loamy fine sand; slightly acid.

The A horizon has hue of 7.5YR or 10YR when moist or dry, value of 2 to 4 when moist and 5 to 7 when dry, and chroma of 2 to 4 when moist or dry. It is slightly acid to strongly acid.

The B horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 6 when moist and 5 to 8 when dry, and chroma of 1 to 4 when moist or dry. It has common to many mottles. The horizon is silty clay loam or silty clay and is slightly acid or medium acid.

The C horizon has hue of 2.5Y or 5Y, value of 4 to 6 when moist and 5 to 8 when dry, and chroma of 1 to 4 when moist and 1 to 3 when dry. It dominantly is silty clay loam or silty clay and is stratified with sandy loam or loamy fine sand. The horizon is slightly acid to neutral.

Cassolary Series

The Cassolary series consists of very deep, moderately well drained soils on hills. These soils formed in reworked glacial drift and marine sediment. Slope is 0 to 8 percent. Elevation is 50 to 500 feet. The average annual precipitation is about 16 to 30 inches, the average annual air temperature is about 50 degrees F, and the average frost-free season is 160 to 200 days.

These soils are coarse-loamy, mixed, mesic Typic Xerochrepts.

Typical pedon of Cassolary fine sandy loam, 0 to 8 percent slopes, about 1 mile north and 1.5 miles east of Sequim, about 50 feet south and 2,700 feet west of the northeast corner of sec. 16, T. 30 N., R. 3 W.

Ap—0 to 8 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; weak fine and very fine granular and subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; many very fine irregular and tubular pores; slightly acid; clear smooth boundary.

Bw1—8 to 14 inches; dark brown (10YR 4/3) very fine sandy loam, pale brown (10YR 6/3) dry; weak fine and very fine angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; many very fine tubular pores and common very fine irregular pores; slightly acid; clear smooth boundary.

Bw2—14 to 22 inches; brown (10YR 5/3) fine sandy loam, light gray (2.5Y 7/2) dry; weak fine and very fine angular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common fine and very fine roots; many fine and very fine tubular pores and common fine and very fine irregular pores; slightly acid; clear smooth boundary.

2C1—22 to 36 inches; olive brown (2.5Y 4/4) loam, light yellowish brown (2.5Y 6/4) dry; common fine distinct dark yellowish brown (10YR 4/6) mottles, yellowish brown (10YR 5/6) dry; massive; very hard, firm, sticky and plastic; common fine and very fine roots; many very fine tubular pores and common very fine irregular pores; slightly acid; clear smooth boundary.

3C2—36 to 60 inches; stratified, olive (5Y 4/3) very fine sandy loam, pale olive (5Y 6/3) dry, and olive brown (2.5Y 4/4) silt loam, light yellowish brown (2.5Y 6/4) dry; the very fine sandy loam part is massive; slightly hard, friable, nonsticky and nonplastic; the silt loam part is massive; hard, friable, slightly sticky and plastic; the horizon has few fine and very fine roots; few very fine tubular pores; slightly acid.

The A horizon has value of 3 or 4 when moist and 5 to 7 when dry, and it has chroma of 3 or 4 when moist or dry. It is slightly acid or medium acid.

The Bw horizon has hue of 10YR or 2.5Y, value of 4 or 5 when moist and 6 or 7 when dry, and chroma of 3 or 4 when moist and 2 to 4 when dry. It commonly has mottles that have chroma of more than 2. The horizon is stratified very fine sandy loam, fine sandy loam, sandy loam, loam, or silt loam and is slightly acid or medium acid.

The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5 when moist and 5 to 7 when dry, and chroma of 3 or 4 when moist or dry. It commonly has mottles that have chroma of more than 2. The horizon is dominantly silty clay loam, silt loam, loam, very fine sandy loam, or clay loam and is stratified with loamy very fine sand, loamy fine sand, gravelly sandy loam, or sand. It is slightly acid or medium acid.

Catla Series

The Catla series consists of shallow, moderately well drained soils on hills. These soils formed in compact glacial till. Slope is 2 to 15 percent. Elevation is 100 to 400 feet. The average annual precipitation is about 18 to 25 inches, the average annual air temperature is about 49 degrees F, and the average growing season (at 28 degrees) is 230 to 260 days.

These soils are loamy, mixed, mesic, shallow Dystric Xerochrepts.

Typical pedon of Catla gravelly sandy loam, 2 to 15 percent slopes, about 7 miles east of Sequim, 2,800 feet north and 600 feet east of the southwest corner of sec. 28, T. 30 N., R. 2 W.

Oi—1.5 inches to 1 inch; needles, leaves, and twigs.

Oa—1 inch to 0; partially decomposed needles, leaves, and twigs.

A—0 to 3 inches; brown (10YR 5/3) gravelly sandy loam, light gray (10YR 7/2) dry; common medium distinct strong brown (7.5YR 5/6) mottles, reddish yellow (7.5YR 7/6) dry; weak fine and very fine granular structure; soft, very friable, slightly sticky and nonplastic; many fine and very fine roots and common medium roots; many fine and very fine irregular and tubular pores; 20 percent pebbles; medium acid; clear smooth boundary.

Bw—3 to 14 inches; brown (10YR 5/3) gravelly sandy loam, light gray (10YR 7/2) dry; common medium distinct strong brown (7.5YR 5/6) mottles, reddish yellow (7.5YR 7/6) dry; weak fine and very fine

subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots and common medium roots; many fine and very fine irregular and tubular pores; 20 percent pebbles; medium acid; clear wavy boundary.

Cr1—14 to 35 inches; pale brown (10YR 6/3) dense glacial till that crushes to gravelly sandy loam, light gray (10YR 7/2) dry; common medium distinct strong brown (7.5YR 5/6) mottles, reddish yellow (7.5YR 7/6) dry; massive; extremely hard, very firm, nonsticky and nonplastic; compact; few very fine roots; few very fine irregular and tubular pores; 30 percent pebbles; medium acid; clear smooth boundary.

Cr2—35 to 60 inches, brown (10YR 5/3) dense glacial till that crushes to gravelly sandy loam, light gray (10YR 7/2) dry; massive; extremely hard, very firm, nonsticky and nonplastic; compact; few fine irregular pores; 30 percent pebbles; neutral.

The control section is 15 to 35 percent rock fragments, dominantly pebbles and a few cobbles. Depth to paralithic, or dense glacial till, contact is 10 to 20 inches.

The A horizon has value of 5 to 7 when dry and 4 or 5 when moist, and it has chroma of 2 or 3 when moist or dry. It is strongly acid or medium acid.

The Bw horizon has value of 6 or 7 when dry and 4 or 5 when moist, and it has chroma of 2 or 3 when moist or dry. It is gravelly loam or gravelly sandy loam and is strongly acid or medium acid.

The Cr horizon has value of 5 or 6 when moist, and it has chroma of 1 to 3 when dry or moist. It is dense glacial till that crushes to gravelly loam or gravelly sandy loam and is medium acid to neutral.

Clallam Series

The Clallam series consists of moderately deep, moderately well drained soils on hills. These soils formed in compact glacial till. Slope is 0 to 30 percent. Elevation is 40 to 1,800 feet. The average annual precipitation is about 16 to 30 inches, and the average annual air temperature is about 48 degrees F. The average frost-free season is 160 to 200 days, and the average growing season (at 28 degrees) is 210 to 260 days.

These soils are loamy-skeletal, mixed, mesic Dystric Xerochrepts.

Typical pedon of Clallam gravelly sandy loam, 0 to 15 percent slopes, about 3 miles south and 8 miles east of Port Angeles, 1,300 feet north and 600 feet east of the southwest corner of sec. 24, T. 30 N., R. 5 W.

Oi—2.5 inches to 1 inch; needles, leaves, and twigs.

Oa—1 inch to 0; partially decomposed needles, leaves, and twigs.

A—0 to 1 inch; dark brown (10YR 4/3) gravelly sandy loam, light brownish gray (10YR 6/2) dry; weak fine and very fine granular structure parting to weak very fine subangular blocky; slightly hard, friable, slightly sticky and nonplastic; many fine and very fine roots; many fine and very fine irregular and tubular pores; 15 percent pebbles; strongly acid; abrupt smooth boundary.

Bw1—1 inch to 10 inches; brown (10YR 5/3) gravelly sandy loam, light gray (2.5Y 7/2) dry; common medium distinct dark yellowish brown (10YR 4/4) mottles, very pale brown (10YR 7/4) dry; weak fine and very fine subangular blocky structure; hard, friable, nonsticky and nonplastic; many fine and very fine roots and common medium roots; many fine and very fine irregular and tubular pores; 20 percent pebbles and 5 percent cobbles; strongly acid; clear smooth boundary.

Bw2—10 to 28 inches; brown (10YR 5/3) very gravelly sandy loam, light gray (2.5Y 7/2) dry; common medium distinct dark yellowish brown (10YR 4/4) mottles, very pale brown (10YR 7/4) dry; weak fine and very fine subangular blocky structure; hard, firm, nonsticky and nonplastic; common fine and very fine roots and few medium roots; many very fine irregular pores and common very fine tubular pores; 35 percent pebbles and 10 percent cobbles; strongly acid; clear wavy boundary.

Cr1—28 to 37 inches; light brownish gray (2.5Y 6/2) dense glacial till that crushes to very gravelly sandy loam, light gray (2.5Y 7/2) dry; common medium distinct strong brown (7.5YR 5/6) mottles, reddish yellow (7.5YR 6/6) dry; massive; very hard, very firm, slightly sticky and nonplastic; few very fine irregular pores and common very fine tubular pores; 30 percent pebbles and 5 percent cobbles; strongly acid; clear wavy boundary.

Cr2—37 to 60 inches; grayish brown (2.5Y 5/2) dense glacial till that crushes to very gravelly loam, light gray (2.5Y 7/2) dry; massive; very hard, very firm, slightly sticky and slightly plastic; few very fine irregular pores; 30 percent gravel and 10 percent cobbles; medium acid.

The control section is 35 to 55 percent pebbles and cobbles. Depth to paralithic contact, or dense glacial till, is 20 to 40 inches.

The A horizon has value of 3 to 5 when moist and 5 to 7 when dry and it has chroma of 2 to 4 when moist or dry. It is slightly acid to strongly acid.

The Bw horizon has hue of 10YR to 5Y, value of 4 or 5 when moist, and chroma of 3 or 4 when moist and 2 to 4 when dry.

The Cr horizon has hue of 10YR to 5Y when moist or dry, value of 4 to 6 when moist and 6 or 7 when dry, and chroma of 2 to 4 when moist and 1 to 4 when dry. It is dense glacial till that crushes to gravelly sandy loam, very gravelly sandy loam, or very gravelly loam. The horizon is slightly acid to strongly acid.

Clallam Variant

The Clallam Variant consists of moderately deep, moderately well drained soils on hills. These soils formed in glacial till and volcanic ash overlying compact glacial till. Slope is 10 to 30 percent. Elevation is 1,300 to 2,000 feet. The average annual precipitation is about 30 to 40 inches, the average annual air temperature is about 46 degrees F, and the average growing season (at 28 degrees) is 210 to 240 days.

These soils are medial-skeletal, mesic Andic Xerochrepts.

Typical pedon of Clallam Variant gravelly loam, 10 to 30 percent slopes, about 3 miles south and 3 miles east of Blyn, 1,400 feet north and 1,000 feet east of the southwest corner of sec. 20, T. 29 N., R. 2 W.

Oi—1 inch to 0; needles, leaves, and twigs.

A—0 to 1 inch; dark brown (7.5YR 3/2) loam, brown (7.5YR 4/2) dry; weak fine and very fine granular structure; soft, very friable, nonsticky and nonplastic; weakly smeary; many very fine and fine roots and common medium roots; many very fine and fine irregular pores and many very fine tubular pores; 5 percent pebbles; strongly acid; clear smooth boundary.

Bw1—1 inch to 7 inches; brown (7.5YR 4/4) gravelly loam, light brown (7.5YR 6/4) dry; weak fine and very fine granular structure parting to weak very fine subangular blocky; soft, very friable, nonsticky and nonplastic; weakly smeary; many very fine and fine roots and common medium roots; many very fine and fine irregular and tubular pores; 30 percent pebbles; medium acid; gradual smooth boundary.

Bw2—7 to 15 inches; brown (7.5YR 4/4) very gravelly loam, light brown (7.5YR 6/4) dry; weak fine and very fine granular structure parting to weak very fine subangular blocky; soft, very friable, nonsticky and nonplastic; weakly smeary; many very fine and fine roots and common medium roots; many very fine and fine irregular and tubular pores; 30 percent pebbles and 10 percent cobbles; medium acid; clear smooth boundary.

BC—15 to 30 inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam, very pale brown (10YR 7/4) dry; weak very fine and fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; weakly smeary; many very fine and fine roots and common medium roots; common very fine and fine irregular and tubular pores; 40 percent pebbles; medium acid; clear smooth boundary.

2Cr1—30 to 38 inches; brown (10YR 4/3) and pale brown (10YR 6/3) dense glacial till that crushes to very gravelly loam, pale brown (10YR 6/3) and light gray (10YR 7/2) dry; common medium distinct brown (7.5YR 4/4) mottles, strong brown (7.5YR 5/6) dry; massive; very hard, very firm, slightly sticky and slightly plastic; few very fine roots; few very fine irregular and tubular pores; 35 percent pebbles; medium acid; clear smooth boundary.

2Cr2—38 to 60 inches; dark grayish brown (2.5Y 4/2) dense glacial till that crushes to very gravelly loam, light gray (2.5Y 7/2) dry; massive; hard, very firm, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; 35 percent pebbles; slightly acid.

The control section is 35 to 50 percent coarse fragments consisting of pebbles and some cobbles. Depth to paralithic contact, or dense glacial till, is 20 to 40 inches.

The A horizon has hue of 5YR or 7.5YR, value of 3 or 4 when moist and 4 to 6 when dry, and chroma of 2 to 4 when moist or dry. It is strongly acid or very strongly acid.

The Bw horizon has hue of 5YR to 10YR, value of 4 or 5 when moist and 6 or 7 when dry, and chroma of 4 to 6 when moist or dry. It generally is very gravelly loam or very gravelly sandy loam, but in some pedons it is gravelly loam in the upper part. The horizon is strongly acid or medium acid.

The BC horizon is very gravelly loam or very gravelly sandy loam, and it has few faint mottles in some pedons. The horizon is strongly acid or medium acid.

The 2Cr horizon has hue of 10YR or 2.5Y, value of 4 to 6 when moist and 6 or 7 when dry, and chroma of 2 or 3 when moist or dry. It is dense glacial till that crushes to very gravelly loam or very gravelly sandy loam. The horizon is medium acid or slightly acid.

Dick Series

The Dick series consists of very deep, somewhat excessively drained soils on outwash terraces. These soils formed in glacial outwash. Slope is 0 to 15 percent. Elevation is near sea level to 500 feet. The average annual precipitation is about 17 to 25 inches, and the average annual air temperature is about 50 degrees F. The average frost-free season is 160 to 200 days, and the average growing season (at 28 degrees) is 230 to 260 days.

These soils are mixed, mesic Alfic Xeropsamments.

Typical pedon of Dick loamy sand, 0 to 15 percent slopes, about 1.5 miles north of Blyn, 600 feet north and 1,600 feet west of the southeast corner of sec. 36, T. 30 N., R. 3 W.

Oi—2 inches to 1 inch; needles, leaves, and twigs.

Oa—1 inch to 0; partially decomposed needles, leaves, and twigs.

E1—0 to 1/4 inch; grayish brown (10YR 5/2) loamy sand, light gray (10YR 7/1) dry; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; many fine and very

fine irregular pores; 1 percent pebbles; medium acid; abrupt smooth boundary.

E2—1/4 inch to 3 inches; dark brown (10YR 4/3) loamy sand, very pale brown (10YR 7/3) dry; weak fine and very fine granular structure; soft, loose, nonsticky and nonplastic; many fine and very fine roots and few medium roots; many fine and very fine irregular pores; 1 percent pebbles; medium acid; clear smooth boundary.

E3—3 to 22 inches; brown (10YR 5/3) sand, light gray (2.5Y 7/2) dry; common fine distinct yellowish brown (10YR 5/4) iron stains, very pale brown (10YR 7/4) dry; single grain; loose; many very fine, fine, and medium roots matted near base of horizon; many fine and very fine irregular pores; 1 percent pebbles; slightly acid; clear smooth boundary.

E&B—22 to 48 inches; the E part is light olive brown (2.5Y 5/4) sand, pale yellow (2.5Y 7/4) dry; single grain; loose; the B part is yellowish brown (10YR 5/4) loamy sand lamellae bands 1/4 to 1/2 inch thick, very pale brown (10YR 7/4) dry; massive; soft, very friable, nonsticky and nonplastic; the horizon has few fine and very fine roots; many fine and very fine irregular pores; 1 percent pebbles; slightly acid; clear smooth boundary.

IIE&B—48 to 60 inches; the E part is olive brown (2.5Y 4/4) gravelly sand, pale yellow (2.5Y 7/4) dry; single grain; loose; the B part is dark yellowish brown (10YR 4/6) gravelly loamy sand lamellae bands 1/2 to 1 inch thick, brownish yellow (10YR 6/6) dry; massive; slightly hard, very friable, nonsticky and nonplastic; the horizon has few fine and very fine roots; many fine and very fine irregular pores; 20 percent pebbles; slightly acid.

The E horizon has hue of 10YR or 2.5Y, value of 4 or 5 when moist and 6 or 7 when dry, and chroma of 2 or 3 when moist and 1 to 3 when dry. It is slightly acid or medium acid.

The E&B horizon has value of 4 or 5 when moist and 6 or 7 when dry, and it has chroma of 2 to 4 when moist or dry. At a depth of less than 40 inches, the horizon is stratified sand and loamy sand and the total thickness of the bands of loamy sand is less than 6 inches. Below a depth of 40 inches, the horizon is stratified gravelly sand and gravelly loamy sand. The horizon is neutral or slightly acid. The total thickness of the lamellae bands in the IIE&B horizon is less than 3 inches.

Dungeness Series

The Dungeness series consists of very deep, well drained soils on flood plains and low river terraces. These soils formed in alluvium. Slope is 0 to 5 percent. Elevation is 25 to 300 feet. The average annual precipitation is about 17 to 25 inches, the average annual air temperature is about 49 degrees F, and the average frost-free season is 170 to 200 days.

These soils are coarse-silty, mixed, nonacid, mesic Mollic Xerofluvents.

Typical pedon of Dungeness silt loam, about 1 mile east of Carlsborg, 600 feet north and 1,200 feet west of the southeast corner of sec. 14, T. 30 N., R. 4 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine and very fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine and very fine irregular and tubular pores; neutral; abrupt smooth boundary.

C1—8 to 12 inches; finely stratified very dark grayish brown (10YR 3/2 and 2.5Y 3/2) silt loam, grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine and very fine tubular and irregular pores; thin bedding planes; neutral; clear smooth boundary.

C2—12 to 20 inches; dark grayish brown (2.5Y 4/2) very fine sandy loam, light brownish gray (2.5Y 6/2) dry; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; many fine and very fine tubular and irregular pores; thin bedding planes; neutral; abrupt smooth boundary.

C3—20 to 30 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; very hard, firm, sticky and plastic; common very fine roots; common fine and very fine tubular and irregular pores; very dark brown (10YR 2/2) organic stains on some ped faces and in some pores; neutral; clear wavy boundary.

C4—30 to 42 inches; 2- to 3-inch strata of dark grayish brown (2.5Y 4/2) silt loam, very fine sandy loam, and silty clay loam, light brownish gray (2.5Y 6/2) dry; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few very fine roots; common fine and very fine tubular and irregular pores; neutral; clear wavy boundary.

C5—42 to 50 inches; dark grayish brown (2.5Y 4/2) very fine sandy loam, light brownish gray (2.5Y 6/2) dry; massive; slightly hard, friable, nonsticky and slightly plastic; few very fine roots; many very fine irregular pores; 3 percent fine pebbles; neutral; clear smooth boundary.

C6—50 to 56 inches; olive gray (5Y 4/2) fine sandy loam, light olive gray (5Y 6/2) dry; massive; soft, very friable, nonsticky and nonplastic; many very fine irregular pores; 5 percent fine pebbles; neutral; clear smooth boundary.

2C7—56 to 60 inches; olive gray (5Y 4/2) fine and medium sand, light olive gray (5Y 6/2) dry; single grain; loose; many very fine irregular pores; 10 percent pebbles; neutral.

The Ap horizon has hue of 10YR or 2.5Y, and it has chroma of 2 or 3 when moist or dry. It is slightly acid or neutral.

The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5 when moist and 5 to 7 when dry, and chroma of 2 to 4 when moist or dry. At a depth of less than 40 inches, it is very fine sandy loam and silt loam with thin strata of fine sandy loam and silty clay loam. Below a depth of 40 inches, it is stratified silt loam to coarse sand and is 0 to 15 percent pebbles. The horizon is slightly acid or neutral.

Elwha Series

The Elwha series consists of moderately deep, moderately well drained soils on hills. These soils formed in compact glacial till. Slope is 0 to 35 percent. Elevation is 200 to 2,000 feet. The average annual precipitation is about 30 to 45 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 260 days.

These soils are coarse-loamy, mixed, mesic Dystric Xerochrepts.

Typical pedon of Elwha gravelly sandy loam, 0 to 15 percent slopes, about 7 miles south and 8 miles east of Port Angeles, 1,000 feet south and 2,000 feet west of the northeast corner of sec. 12, T. 29 N., R. 5 W.

Oi—2 inches to 1 inch; needles, leaves, and twigs.

Oa—1 inch to 0; partially decomposed needles, leaves, and twigs.

A—0 to 4 inches; dark brown (10YR 3/3) gravelly sandy loam, pale brown (10YR 6/3) dry; weak fine and very fine granular structure; soft, friable, nonsticky and nonplastic; many fine and very fine roots; many fine and very fine irregular and tubular pores; 15 percent pebbles; strongly acid; gradual smooth boundary.

Bw1—4 to 12 inches; brown (10YR 4/3) gravelly sandy loam, very pale brown (10YR 7/3) dry; few fine distinct yellowish brown (10YR 5/4) mottles, very pale brown (10YR 7/4) dry; weak fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium roots and many fine and very fine roots; many fine and very fine irregular and tubular pores; 15 percent pebbles and 5 percent cobbles; strongly acid; gradual smooth boundary.

Bw2—12 to 24 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam, very pale brown (10YR 7/4) dry; common fine distinct dark yellowish brown (10YR 4/6) mottles, yellow (10YR 7/6) dry; weak fine and very fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common medium roots and many fine and very fine roots; many very fine irregular pores and many fine and very fine tubular pores; 20 percent pebbles and 5 percent cobbles; strongly acid; clear smooth boundary.

Bw3—24 to 33 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam, very pale brown (10YR 7/4) dry; common medium distinct yellowish brown (10YR 5/6) mottles, yellow (10YR 7/6) dry; weak medium and fine subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common fine and very fine roots; common very fine irregular and tubular pores; 20 percent pebbles and 5 percent cobbles; medium acid; clear smooth boundary.

Cr1—33 to 42 inches; light yellowish brown (2.5Y 6/4) dense glacial till that crushes to gravelly sandy loam, pale yellow (2.5Y 7/4) dry; common medium distinct dark yellowish brown (10YR 4/6) mottles, brownish yellow (10YR 6/6) dry; massive; very hard, firm, slightly sticky and slightly plastic; few very fine roots in cracks; few very fine irregular and tubular pores; 30 percent pebbles; slightly acid; clear smooth boundary.

Cr2—42 to 60 inches; grayish brown (2.5Y 5/2) dense glacial till that crushes to gravelly sandy loam, light gray (2.5Y 7/2) dry; few medium distinct dark yellowish brown (10YR 4/6) mottles, brownish yellow (10YR 6/6) dry; massive; very hard, firm, slightly sticky and slightly plastic; few very fine roots in cracks; few very fine irregular pores; 40 percent pebbles; neutral.

The control section is 15 to 30 percent coarse fragments consisting mainly of pebbles and 0 to 5 percent cobbles. Depth to paralithic contact, or dense glacial till, is 20 to 40 inches.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist and 5 to 7 when dry, and chroma of 3 or 4 when moist or dry. It is medium acid or strongly acid.

The Bw horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 6 when moist and 6 to 8 when dry, and chroma of 2 to 4 when moist or dry. It is gravelly sandy loam or gravelly loam and is medium acid or strongly acid.

The Cr horizon has hue of 2.5Y or 5Y, and it has value of 4 to 6 when moist and 7 or 8 when dry. It is dense glacial till that crushes to gravelly sandy loam, very gravelly sandy loam, gravelly loam, or very gravelly loam. It is medium acid to neutral.

Hoh Series

The Hoh series consists of very deep, well drained soils on low terraces and flood plains. These soils formed in alluvium. Slope is 0 to 2 percent. Elevation is near sea level to 500 feet. The average annual precipitation is about 90 to 140 inches, and the average annual air temperature is about 50 degrees F. The average frost-free season is 160 to 190 days, and the

average growing season (at 28 degrees) is 220 to 250 days.

These soils are coarse-loamy, mixed, acid, mesic Typic Udifluvents.

Typical pedon of Hoh silt loam, about 2 miles south of Forks, 2,200 feet south and 2,600 feet east of the northwest corner of sec. 20, T. 28 N., R. 13 W.

Oi—1 inch to 0; needles, leaves, and twigs.

A—0 to 7 inches; dark grayish brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; weak fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many fine and very fine irregular and tubular pores; very strongly acid; gradual smooth boundary.

AC—7 to 21 inches; dark brown (10YR 4/3), stratified very fine sandy loam and silt loam, pale brown (10YR 6/3) dry; weak fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many fine and very fine tubular or irregular pores; very strongly acid; gradual smooth boundary.

C1—21 to 37 inches; dark brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; thin bands of loamy sand less than 1 inch thick; few fine prominent dark yellowish brown (10YR 4/6) stains, yellowish brown (10YR 5/8) dry; massive parting to single grain; soft, very friable, nonsticky and nonplastic; common very fine roots; many fine and very fine irregular and tubular pores; very strongly acid; gradual smooth boundary.

C2—37 to 60 inches; dark grayish brown (2.5Y 4/2), stratified fine sandy loam and loamy sand, light brownish gray (2.5Y 6/2) dry; massive parting to single grain; soft, very friable, nonsticky and nonplastic; few very fine roots; many fine and very fine irregular and tubular pores; very strongly acid.

Depth to sand or gravelly sand is more than 40 inches. The profile is very strongly acid or strongly acid.

The A horizon has hue of 10YR or 2.5Y, value of 3 or 4 when moist, and chroma of 2 or 3 when moist or dry.

The C horizon has value of 3 or 4 when moist, and it has chroma of 2 to 4 when moist and 1 to 3 when dry. It is mainly fine sandy loam, but it has thin strata of loamy sand, fine sand and medium sand.

Hoypus Series

The Hoypus series consists of very deep, somewhat excessively drained soils on terraces and terrace escarpments. These soils formed in glacial outwash. Slope is 0 to 65 percent. Elevation is 50 to 1,000 feet. The average annual precipitation is about 18 to 30 inches, the average annual air temperature is about 49 degrees F, and the average growing season (at 28 degrees) is 220 to 260 days.

These soils are sandy-skeletal, mixed, mesic Typic Xerorthents.

Typical pedon of Hoypus gravelly sandy loam, 15 to 30 percent slopes, about 8 miles east of Sequim, 1,500 feet north and 2,000 feet east of the southwest corner of sec. 15, T. 30 N., R. 2 W.

Oi—1 inch to 0; litter.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) gravelly sandy loam, grayish brown (10YR 5/2) dry; weak fine and very fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many fine and very fine roots; many fine and very fine tubular and irregular pores; 25 percent pebbles; medium acid; clear smooth boundary.

Bw1—3 to 10 inches; dark brown (10YR 4/3) gravelly sandy loam, pale brown (10YR 6/3) dry; weak fine and very fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many fine and very fine roots; many fine and very fine irregular and tubular pores; 30 percent pebbles; medium acid; clear smooth boundary.

Bw2—10 to 31 inches; dark yellowish brown (10YR 3/6) very gravelly loamy sand, brownish yellow (10YR 6/6) dry; single grain; soft, friable, nonsticky and nonplastic; many fine and very fine roots; many fine and very fine irregular and tubular pores; 40 percent pebbles and 5 percent cobbles; medium acid; clear smooth boundary.

C1—31 to 45 inches; dark brown (10YR 4/3) very gravelly sand, pale brown (10YR 6/3) dry; single grain; loose; common fine and very fine roots; many fine and very fine tubular and irregular pores; 35 percent pebbles; slightly acid; gradual smooth boundary.

C2—45 to 60 inches; dark yellowish brown (10YR 4/4) gravelly sand, light yellowish brown (10YR 6/4) dry; single grain; loose; few fine and very fine roots; common fine and very fine tubular pores and many fine and very fine irregular pores; 20 percent pebbles; slightly acid.

The control section is 35 to 60 percent rock fragments, including 0 to 10 percent cobbles.

The A horizon has value of 3 or 4 when moist and 5 or 6 when dry, and it has chroma of 2 or 3 when moist or dry. It is medium acid or strongly acid.

The Bw horizon has value of 3 to 5 when moist and 6 or 7 when dry, and it has chroma of 2 to 6 when moist or dry. It is very gravelly sandy loam, very gravelly loamy sand, or very gravelly sand and is slightly acid or medium acid.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5 when moist and 6 or 7 when dry, and chroma of 3 or 4 when moist or dry. It is very gravelly loamy sand or very gravelly sand to a depth of 45 inches and is gravelly

sand or very gravelly sand below this depth. The horizon is slightly acid or medium acid.

Hyas Series

The Hyas series consists of very deep, well drained soils on mountainsides. These soils formed in residuum and colluvium derived from basalt. Slope is 50 to 80 percent. Elevation is 1,600 to 2,500 feet. The average annual precipitation is about 100 to 140 inches, the average annual air temperature is about 43 degrees F, and the average growing season (at 28 degrees) is 200 to 230 days.

These soils are medial, frigid Andic Haplumbrepts.

Typical pedon of Hyas gravelly loam, 50 to 80 percent slopes, 6 miles north of Lake Pleasant, about 400 feet west and 200 feet south of the northeast corner of sec. 35, T. 31 N., R. 13 W.

Oi—2 inches to 0; needles, leaves, and twigs.

A—0 to 13 inches; dark brown (7.5YR 3/2) gravelly loam, brown (10YR 4/3) dry; moderate fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; weakly smeary; many very fine, fine, and medium roots; many fine and very fine irregular and tubular pores; 20 percent hard pebbles, 5 percent hard cobbles, and 20 percent soft pebbles; very strongly acid; gradual smooth boundary.

Bw1—13 to 21 inches; dark brown (7.5YR 3/4) gravelly loam, brown (7.5YR 5/4) dry; moderate very fine, fine, and medium angular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; many fine and very fine roots; many fine and very fine irregular and tubular pores; 20 percent hard pebbles, 5 percent hard cobbles, and 25 percent soft pebbles; strongly acid; gradual smooth boundary.

Bw2—21 to 38 inches; brown (7.5YR 4/4) gravelly loam, yellowish brown (10YR 5/4) dry; moderate very fine, fine, and medium angular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; common fine and very fine roots; many fine and very fine irregular and tubular pores; 20 percent hard pebbles, 5 percent hard cobbles, and 25 percent soft pebbles; strongly acid; gradual smooth boundary.

C—38 to 60 inches; brown (7.5YR 4/4) very gravelly loam, yellowish brown (10YR 5/4) dry; massive; slightly hard, friable, sticky and plastic; weakly smeary; few fine and very fine roots; many fine and very fine irregular pores; 30 percent hard pebbles, 10 percent hard cobbles, and 25 percent soft pebbles; strongly acid.

The control section is 20 to 35 percent hard pebbles and cobbles and 15 to 40 percent soft pebbles.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 2 or 3 when moist or dry. It is strongly acid or very strongly acid.

The Bw horizon has hue of 7.5YR or 10YR, value of 3 to 5 when moist and 4 or 5 when dry, and chroma of 3 to 6 when moist and 4 to 6 when dry. It is strongly acid or medium acid.

The C horizon has hue of 7.5YR or 10YR, value of 4 or 5 when moist and 5 to 7 when dry, and chroma of 4 to 6 when moist or dry. It is gravelly loam or very gravelly loam and is strongly acid or medium acid.

Ilwaco Series

The Ilwaco series consists of very deep, well drained soils on foothills. These soils formed in material derived from highly weathered sandstone and loess. Slope is 15 to 35 percent. Elevation is 50 to 1,600 feet. The average annual precipitation is about 80 to 120 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

These soils are medial, mesic Andic Haplumbrepts.

Typical pedon of Ilwaco silt loam, 15 to 35 percent slopes, about 2 miles west and 3 miles south of Forks, 1,200 feet north and 2,000 feet west of the southeast corner of sec. 19, T. 28 N., R. 13 W.

Oi—2 inches to 1 inch; needles, leaves, and twigs.

Oa—1 inch to 0; partially decomposed litter.

A—0 to 12 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine and very fine subangular blocky structure and weak fine and very fine granular; slightly hard, friable, slightly sticky and slightly plastic; weakly smeary; common medium roots and many fine and very fine roots; many fine and very fine tubular and irregular pores; very strongly acid; clear smooth boundary.

Bw1—12 to 25 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; moderate fine and very fine subangular blocky structure; hard, friable, slightly sticky and plastic; weakly smeary; common medium roots and many fine and very fine roots; many fine and very fine irregular and tubular pores; very strongly acid; clear smooth boundary.

Bw2—25 to 44 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; moderate fine and very fine angular blocky structure; hard, friable, sticky and plastic; weakly smeary; common fine and very fine roots; common fine and very fine irregular and tubular pores; very strongly acid; gradual smooth boundary.

Bw3—44 to 60 inches; yellowish brown (10YR 5/4) silt loam, very pale brown (10YR 7/4) dry; moderate fine and very fine angular blocky structure; hard,

friable, sticky and plastic; weakly smeary; few fine and very fine roots; common fine and very fine irregular and tubular pores; very strongly acid.

The profile is very strongly acid or strongly acid.

The A horizon has value of 4 or 5 when dry, and it has chroma of 2 or 3 when moist.

The Bw horizon has value of 4 to 6 when moist and 5 to 7 when dry, and it has chroma of 3 to 6 when moist. It is silt loam or loam.

Klone Series

The Klone series consists of very deep, well drained soils on terraces and terrace escarpments. These soils formed in poorly sorted glacial outwash. Slope is 0 to 65 percent. Elevation is 50 to 1,200 feet. The average annual precipitation is about 80 to 130 inches, the average annual air temperature is about 49 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

These soils are medial-skeletal, mesic Andic Haplumbrepts.

Typical pedon of Klone very gravelly loam, 0 to 15 percent slopes, about 9 miles west of Forks, 400 feet north and 400 feet west of the southeast corner of sec. 1, T. 28 N., R. 15 W.

Oi—2 inches to 0; needles, leaves, and twigs.

A—0 to 10 inches; dark brown (10YR 3/3) very gravelly loam, brown (10YR 4/3) dry; moderate fine and very fine angular blocky structure; slightly hard, friable, slightly sticky and plastic; weakly smeary; many very fine, fine, and medium roots; many fine and very fine irregular and tubular pores; 40 percent pebbles and 5 percent cobbles; very strongly acid; gradual smooth boundary.

Bw1—10 to 26 inches; dark yellowish brown (10YR 3/4) very gravelly loam, dark yellowish brown (10YR 4/4) dry; moderate fine and very fine angular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; many fine and very fine roots and common medium roots; many fine and very fine irregular and tubular pores; 45 percent pebbles and 10 percent cobbles; very strongly acid; gradual smooth boundary.

Bw2—26 to 49 inches; dark yellowish brown (10YR 4/4) very gravelly loam, yellowish brown (10YR 5/4) dry; weak fine and very fine angular blocky structure; slightly hard, friable, slightly sticky and plastic; weakly smeary; few fine and very fine roots; many fine and very fine irregular and tubular pores; 45 percent pebbles and 10 percent cobbles; strongly acid; gradual smooth boundary.

2C—49 to 60 inches; brown (10YR 4/3) extremely gravelly loamy sand, yellowish brown (10YR 5/4) dry; single grain; loose; few very fine roots; many fine and very fine irregular pores; 65 percent pebbles and 5 percent cobbles; strongly acid.

The control section is 35 to 60 percent rock fragments, of which 30 to 45 percent is rounded pebbles and 5 to 15 percent is rounded cobbles.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3 when moist and 3 to 5 when dry, and chroma of 2 or 3 when moist or dry.

The Bw horizon has hue of 7.5YR or 10YR, value of 3 to 5 when moist and 4 to 7 when dry, and chroma of 2 to 6 when moist and 3 to 6 when dry. It is very gravelly silt loam, very gravelly loam, or very gravelly sandy loam and is strongly acid or very strongly acid.

The 2C horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 3 or 4 when moist and 4 to 6 when dry, and chroma of 2 to 4 when moist and 3 or 4 when dry. It is extremely gravelly loamy sand, very gravelly sand, extremely gravelly sand, or very cobbly sand. The horizon is strongly acid or medium acid.

Kydaka Series

The Kydaka series consists of moderately deep, poorly drained soils in basins on hills. These soils formed in loess and glacial drift over dense, compact glacial till. Slope is 0 to 5 percent. Elevation is 100 to 500 feet. The average annual precipitation is about 75 to 95 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 220 to 250 days.

These soils are medial, acid, mesic Typic Humaquepts.

Typical pedon of Kydaka silty clay loam, about 3 miles south of Lake Ozette, 100 feet south and 2,600 feet west of the northeast corner of sec. 28, T. 29 N., R. 15 W.

Oi—3.5 to 3 inches; needles, leaves, and twigs.

Oa—3 inches to 0; decomposed needles, leaves, and twigs.

A—0 to 5 inches; very dark brown (10YR 2/2) silty clay loam, grayish brown (10YR 5/2) dry; weak fine and medium angular blocky structure; hard, friable, sticky and very plastic; weakly smeary; many very fine, fine, and medium roots; many very fine and fine tubular pores; very strongly acid; clear smooth boundary.

Bw—5 to 11 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; few fine distinct yellowish brown (10YR 5/4) mottles, light yellowish brown (10YR 6/4) dry; weak fine and medium angular blocky structure; hard, friable, sticky and very plastic; weakly smeary; many very fine, fine, and medium roots; common very fine and fine tubular pores; 5 percent pebbles; very strongly acid; abrupt smooth boundary.

BCg—11 to 21 inches; dark grayish brown (2.5Y 4/2) gravelly clay loam, light brownish gray (2.5Y 6/2) dry; common medium prominent dark yellowish brown (10YR 4/6) mottles, yellowish brown (10YR 5/6) dry; weak fine subangular blocky structure; hard, firm, sticky and plastic; weakly smeary; few very fine and fine tubular pores; 20 percent pebbles; very strongly acid; clear smooth boundary.

Cg—21 to 30 inches; olive gray (5Y 4/2) gravelly loam, light gray (5Y 6/1) dry; common medium prominent dark yellowish brown (10YR 4/6) mottles, yellowish brown (10YR 5/6) dry; massive; hard, firm, sticky and plastic; weakly smeary; few very fine roots; common very fine and fine tubular pores; 30 percent pebbles; very strongly acid; clear smooth boundary.

2Cr—30 to 60 inches; dark gray (5Y 4/1) dense glacial till that crushes to gravelly clay loam, light gray (5Y 6/1) dry; common medium prominent dark yellowish brown (10YR 4/6) mottles, yellowish brown (10YR 5/6) dry; massive; hard, very firm, sticky and plastic; few very fine roots; few very fine tubular pores, 30 percent pebbles; very strongly acid.

The control section is 10 to 30 percent rock fragments, dominantly pebbles and a few cobbles. Depth to paralithic contact, or dense glacial till, is 20 to 40 inches.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry.

The Bw horizon has value of 3 or 4 when moist and 4 or 5 when dry.

The BCg horizon, where present, has hue of 2.5Y or 5Y, and it has value of 6 or 7 when dry. In some pedons it has chroma of 4 when moist or dry. The horizon is clay loam, gravelly clay loam, or gravelly silty clay loam.

The Cg horizon has hue of 2.5Y or 5Y, value of 4 to 7 when moist and 6 to 8 when dry, and chroma of 1 to 4 when moist or dry. It is gravelly loam, gravelly clay loam, or gravelly silty clay loam.

The 2Cr horizon is dense glacial till that crushes to gravelly loam, gravelly clay loam, or gravelly silty clay loam.

Louella Series

The Louella series consists of very deep, well drained soils on mountainsides. These soils formed in residuum and colluvium derived from basalt and flow breccia. Slope is 10 to 90 percent. Elevation is 200 to 2,000 feet. The average annual precipitation is about 30 to 45 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 260 days.

These soils are fine-loamy, mixed, mesic Ultic Haploxerolls.

Typical pedon of Louella gravelly loam, 30 to 65 percent slopes, about 5 miles south of Sequim, 800 feet north and 600 feet east of the southwest corner of sec. 18, T. 29 N., R. 3 W.

Oe—1 inch to 0; partially decomposed needles, leaves, and twigs.

A—0 to 2 inches; dark brown (10YR 3/3) gravelly loam, yellowish brown (10YR 5/4) dry; weak very fine subangular blocky structure and weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium and coarse roots; many very fine and fine irregular and tubular pores; 15 percent hard pebbles; slightly acid; clear smooth boundary.

AB—2 to 11 inches; dark brown (10YR 3/3) gravelly loam, brown (7.5YR 5/4) dry; weak very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium and coarse roots; many very fine and fine irregular and tubular pores; 15 percent hard pebbles; slightly acid; clear smooth boundary.

Bw1—11 to 17 inches; dark yellowish brown (10YR 3/6) gravelly clay loam, yellowish brown (10YR 5/6) dry; weak very fine and fine subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine, fine, medium, and coarse roots; many very fine irregular and tubular pores; 20 percent hard pebbles; slightly acid; gradual smooth boundary

Bw2—17 to 34 inches; dark yellowish brown (10YR 3/6) gravelly loam, yellowish brown (10YR 5/6) dry; weak very fine and fine subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine, fine, medium, and coarse roots; many very fine irregular and tubular pores; 25 percent hard pebbles and 10 percent soft pebbles; slightly acid; clear wavy boundary.

Bw3—34 to 47 inches, dark yellowish brown (10YR 3/4) gravelly loam, yellowish brown (10YR 5/4) dry; weak very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; common very fine irregular pores and few very fine tubular pores; 30 percent hard pebbles and 40 percent soft pebbles; neutral; gradual wavy boundary.

C—47 to 60 inches; dark yellowish brown (10YR 3/6) gravelly sandy loam, yellowish brown (10YR 5/6) dry; massive; slightly hard, friable, nonsticky and nonplastic; few very fine roots; few very fine irregular and tubular pores, 30 percent hard pebbles and 50 percent soft pebbles; neutral.

The control section is 15 to 30 percent hard rock fragments and 10 to 50 percent soft saprolite fragments.

The A horizon has hue of 7.5YR or 10YR, value of 5 or 6 when dry, and chroma of 3 or 4 when moist or dry. It is medium acid to neutral.

The Bw horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist and 4 to 6 when dry, and chroma of 3 to 6 when moist or dry. It is gravelly loam or gravelly clay loam and is medium acid to neutral.

The C horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist and 5 or 6 when dry, and chroma of 4 to 6 when moist or dry. It is gravelly loam, gravelly sandy loam, or gravelly coarse sandy loam and is slightly acid or neutral.

Louella Variant

The Louella Variant consists of very deep, well drained soils on alluvial fans. These soils formed in alluvium. Slope is 2 to 15 percent. Elevation is 400 to 600 feet. The average annual precipitation is about 40 to 45 inches, the average annual air temperature is about 49 degrees F, and the average growing season (at 28 degrees) is 230 to 260 days.

These soils are loamy-skeletal, mixed, mesic Dystric Xerochrepts.

Typical pedon of Louella Variant very gravelly loam, 2 to 15 percent slopes, about 3 miles west of Lake Aldwell, 2,500 feet south and 1,000 feet west of the northeast corner of sec. 19, T. 30 N., R. 7 W.

Oe—1 inch to 0; partially decomposed needles, leaves, and twigs.

A—0 to 5 inches; dark brown (10YR 4/3) very gravelly loam, pale brown (10YR 6/3) dry; weak very fine granular structure and weak very fine subangular blocky; soft, friable, sticky and plastic; many fine and very fine roots and few medium roots; many very fine irregular and tubular pores; 40 percent pebbles; medium acid; clear smooth boundary.

Bw1—5 to 21 inches; yellowish brown (10YR 5/4) very gravelly loam, very pale brown (10YR 7/4) dry; moderate fine and very fine subangular blocky structure; slightly hard, friable, sticky and plastic; many fine and very fine roots and few medium roots; many very fine irregular and tubular pores; 50 percent pebbles; medium acid; clear smooth boundary.

Bw2—21 to 47 inches; light olive brown (2.5Y 5/4) very gravelly clay loam, pale yellow (2.5Y 7/4) dry; moderate fine and very fine subangular blocky structure; slightly hard, friable, sticky and plastic; common fine and very fine roots and few medium roots; common very fine irregular and tubular pores; 40 percent pebbles; strongly acid; clear smooth boundary.

Bw3—47 to 60 inches; olive brown (2.5Y 4/4) very gravelly loam, light yellowish brown (2.5Y 6/4) dry; weak fine and very fine subangular blocky structure; slightly hard, friable, sticky and plastic; few fine and very fine roots; common very fine irregular pores and few very fine tubular pores; 50 percent pebbles; strongly acid.

The control section is about 50 percent fine pebbles. Some pedons have a few mottles in the lower part of the solum.

The A horizon has value of 6 or 7 when dry. It is strongly acid or medium acid.

The Bw horizon has hue of 7.5YR, 10YR, or 2.5Y, and it has chroma of 3 or 4 when dry. It is very gravelly loam or very gravelly clay loam and is strongly acid or medium acid.

Lummi Series

The Lummi series consists of very deep, poorly drained soils on low terraces and flood plains. These soils formed in marine sediment and alluvium. Slope is 0 to 3 percent. Elevation is near sea level to 20 feet. The average annual precipitation is about 25 to 30 inches, the average annual air temperature is about 49 degrees F, and the average frost-free season is 170 to 200 days.

These soils are fine-silty, mixed, mesic Fluvaquentic Haplaquolls.

Typical pedon of Lummi silt loam, about 4 miles north of Sequim, 2,500 feet north and 1,200 feet east of the southwest corner of sec. 31, T. 31 N., R. 3 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine, fine, and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine and very fine tubular pores and common very fine irregular pores; mildly alkaline; clear smooth boundary.

Bg1—9 to 23 inches; dark grayish brown (2.5Y 4/2), stratified very fine sandy loam to silty clay loam, light brownish gray (2.5Y 6/2) dry; common medium prominent dark yellowish brown (10YR 4/6) mottles and few fine prominent greenish gray (5G 5/1) mottles, brownish yellow (10YR 6/6) dry; weak fine and very fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common fine and very fine roots; many fine and very fine tubular pores and common very fine irregular pores; mildly alkaline; clear smooth boundary.

Bg2—23 to 40 inches; dark greenish gray (5GY 4/1), stratified silt loam to silty clay loam, gray (5Y 6/1) dry; many medium prominent dark yellowish brown (10YR 4/4) mottles, light yellowish brown (10YR 6/4) dry; weak fine and medium angular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; many fine and very fine tubular pores; mildly alkaline; clear smooth boundary.

Cg—40 to 60 inches; dark greenish gray (5BG 4/1), stratified silt loam to very fine sandy loam, gray (5Y 6/1) dry; many medium prominent dark yellowish brown (10YR 4/4) mottles, light yellowish brown

(10YR 6/4) dry; massive; hard, friable, slightly sticky and plastic; few very fine roots, few very fine tubular pores; neutral.

The control section is 0 to 5 percent coarse fragments.

The A horizon is neutral or mildly alkaline.

The Bg horizon has hue of 2.5Y, 5Y, or 5GY when moist and 2 5Y or 5Y when dry, value of 3 to 5 when moist and 5 or 6 when dry, and chroma of 1 or 2 when moist or dry. It is stratified very fine sandy loam, silt loam, or silty clay loam. The horizon is neutral or mildly alkaline.

The C horizon has hue of 5G or 5BG. It is stratified very fine sandy loam and silt loam. It is neutral or mildly alkaline.

Lyre Series

The Lyre series consists of very deep, somewhat excessively drained soils on outwash terraces and terrace escarpments. These soils formed in glacial outwash. Slope is 0 to 30 percent. Elevation is 50 to 800 feet. The average annual precipitation is about 60 to 90 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 220 to 250 days

These soils are medial-skeletal, mesic Andic Xerochrepts.

Typical pedon of Lyre very gravelly sandy loam, 0 to 15 percent slopes, about 7 miles west of Joyce, 1,200 feet north and 1,000 feet west of the southeast corner of sec. 6, T. 30 N., R. 9 W.

Oi—1 inch to 0; needles, leaves, and twigs.

Bhs—0 to 5 inches; dark brown (7.5YR 3/2) very gravelly sandy loam, grayish brown (7.5YR 5/2) dry; weak very fine granular structure and weak very fine subangular blocky; soft, friable, slightly sticky and slightly plastic; weakly smeary; many fine and very fine roots; many fine and very fine irregular pores and many very fine tubular pores; 35 percent pebbles and 5 percent cobbles; very strongly acid; clear smooth boundary.

Bs1—5 to 12 inches; strong brown (7.5YR 4/6) very gravelly sandy loam, brownish yellow (10YR 6/6) dry; weak fine and very fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; weakly smeary; many fine and very fine roots; many fine and very fine irregular pores and many very fine tubular pores; 35 percent pebbles and 5 percent cobbles; strongly acid; clear smooth boundary.

Bs2—12 to 30 inches; dark yellowish brown (10YR 4/6) very gravelly sandy loam, brownish yellow (10YR 6/6) dry; weak fine and very fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine and very fine irregular pores; 45 percent pebbles and 5 percent cobbles; strongly acid; clear wavy boundary.

2C—30 to 60 inches; dark yellowish brown (10YR 4/4) extremely gravelly sand, light yellowish brown (10YR 6/4) dry; single grain; loose; common fine and very fine roots; many fine and very fine irregular pores; 45 percent pebbles and 20 percent cobbles; medium acid.

The control section is about 50 to 70 percent pebbles and cobbles.

The Bhs horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry, and chroma of 2 or 3 when moist or dry. It is medium acid to very strongly acid.

The Bs horizon has value of 3 or 4 when moist and 5 or 6 when dry, and it has chroma of 4 to 6 when moist or dry. It is very gravelly sandy loam or extremely gravelly sandy loam and is strongly acid or medium acid.

The 2C horizon has hue of 10YR or 2.5Y, and it has chroma of 4 to 6 when moist or dry. It is very gravelly sand, extremely gravelly sand, very gravelly loamy sand, or extremely gravelly loamy sand.

Makah Series

The Makah series consists of very deep, well drained soils on mountainsides. These soils formed in residuum and colluvium derived from basalt. Slope is 50 to 80 percent. Elevation is 400 to 1,800 feet. The average annual precipitation is about 90 to 140 inches, the average annual air temperature is about 47 degrees F, and the average growing season (at 28 degrees) is 210 to 240 days.

These soils are medial, mesic Andic Haplumbrepts.

Typical pedon of Makah gravelly loam, 50 to 80 percent slopes, about 11 miles west of Sekiu, 2,400 feet south and 900 feet east of the northwest corner of sec. 20, T. 32 N., R. 14 W.

Oi—3 to 2 inches; needles, leaves, and twigs.

Oe—2 inches to 0; partially decomposed needles, leaves, and twigs.

A—0 to 14 inches; dark brown (7.5YR 3/2) gravelly loam, brown (7.5YR 4/2) dry; moderate very fine, fine, and medium subangular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; many very fine, fine, and medium roots; many fine and very fine irregular and tubular pores; 20 percent hard pebbles, 5 percent hard cobbles, and 15 percent soft pebbles; strongly acid; gradual smooth boundary.

Bw1—14 to 29 inches; brown (7.5YR 4/4) gravelly loam, yellowish brown (10YR 5/4) dry; weak to moderate very fine, fine, and medium angular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; many fine and very fine roots; many fine and very fine irregular and tubular pores; 20 percent

hard pebbles, 5 percent hard cobbles, and 20 percent soft pebbles; strongly acid; gradual smooth boundary.

Bw2—29 to 45 inches; strong brown (7.5YR 5/6) gravelly loam, brownish yellow (10YR 6/6) dry; weak to moderate very fine, fine, and medium angular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; many very fine roots; many fine and very fine irregular and tubular pores; 25 percent hard pebbles, 5 percent hard cobbles, and 25 percent soft pebbles; strongly acid; gradual irregular boundary.

C—45 to 60 inches; dark yellowish brown (10YR 4/4) very gravelly loam, brownish yellow (10YR 6/6) dry; massive; slightly hard, friable, sticky and plastic; weakly smeary; common very fine roots; common fine and very fine irregular pores and common very fine tubular pores; 30 percent hard pebbles, 10 percent hard cobbles, and 20 percent soft pebbles; strongly acid.

The control section is 15 to 30 percent hard pebbles and cobbles and 15 to 40 percent soft pebbles.

The A horizon has value of 4 or 5 when dry, and it has chroma of 2 or 3 when moist or dry. It is strongly acid or very strongly acid.

The Bw horizon has hue of 7.5YR or 10YR, and it has value of 3 to 5 when moist and 4 to 6 when dry. It is strongly acid or medium acid.

The C horizon has hue of 7.5YR or 10YR, value of 3 to 5 when moist and 4 to 6 when dry, and chroma of 4 to 6 when moist. It is very gravelly loam or gravelly loam and is slightly acid or medium acid.

McKenna Series

The McKenna series consists of moderately deep, poorly drained soils in basins and drainageways. These soils formed in glacial drift. Slope is 0 to 5 percent. Elevation is 50 to 1,000 feet. The average annual precipitation is about 30 to 50 inches, the average annual air temperature is about 50 degrees F, and the average frost-free season is 150 to 180 days.

These soils are loamy-skeletal, mixed, nonacid, mesic Mollic Haplaquepts.

Typical pedon of McKenna gravelly silt loam, about 2 miles north and 1 mile east of Blyn, 2,500 feet south and 1,000 feet west of the northeast corner of sec. 31, T. 30 N., R. 2 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) gravelly silt loam, gray (10YR 5/1) dry; weak fine and very fine granular structure and weak fine and very fine subangular blocky; slightly hard, friable, sticky and plastic; many fine and very fine roots; many fine and very fine tubular pores and many very fine irregular pores; 20 percent pebbles; neutral; abrupt smooth boundary.

Bg1—8 to 18 inches; grayish brown (2.5Y 5/2) gravelly loam, light gray (2.5Y 7/2) dry; common medium distinct dark yellowish brown (10YR 4/6) mottles, brownish yellow (10YR 6/6) dry; moderate medium angular blocky structure; hard, firm, sticky and plastic; many fine and very fine roots; many fine and very fine tubular pores and many very fine irregular pores; 20 percent pebbles; neutral; abrupt smooth boundary.

Bg2—18 to 24 inches; light olive gray (5Y 6/2) very gravelly loam, white (5Y 8/2) dry; common medium distinct dark yellowish brown (10YR 4/6) mottles, brownish yellow (10YR 6/6) dry; weak fine and medium angular blocky structure; hard, firm, sticky and plastic; many very fine roots; many very fine tubular and irregular pores; 40 percent pebbles; neutral; clear smooth boundary.

BCg—24 to 32 inches; olive gray (5Y 5/2) very gravelly sandy loam, light gray (5Y 7/2) dry; common medium distinct dark yellowish brown (10YR 4/6) mottles, brownish yellow (10YR 6/6) dry; massive; slightly hard, friable, nonsticky and nonplastic; common very fine roots; many very fine irregular pores and few very fine tubular pores; 50 percent pebbles; neutral; clear smooth boundary.

Cr—32 to 60 inches; olive gray (5Y 5/2) dense glacial till that crushes to very gravelly sandy loam, light gray (5Y 7/2) dry; common medium distinct dark yellowish brown (10YR 4/6) mottles, brownish yellow (10YR 6/6) dry; massive; hard, firm, nonsticky and nonplastic; few very fine irregular pores; 50 percent pebbles; neutral.

The control section is 35 to 50 percent rock fragments. Depth to paralithic contact, or dense glacial till, is 20 to 40 inches. The profile is medium acid to neutral throughout.

The A horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 1 or 2 when moist or dry.

The Bg horizon has hue of 10YR, 2.5Y, or 5Y, and it has value of 4 to 6 when moist and 7 or 8 when dry. The upper part of the horizon is gravelly silt loam or gravelly clay loam, and the lower part is very gravelly loam, very gravelly sandy loam, or very gravelly clay loam.

The Cr horizon has hue of 5Y or 5BG when moist, and it has chroma of 1 or 2 when moist or dry. It is mottled in most pedons. The horizon is dense, compact glacial till that crushes to gravelly loam or very gravelly sandy loam.

Mukilteo Series

The Mukilteo series consists of very deep, very poorly drained soils in basins on terraces and in river valleys. These soils formed in organic material. Slope is 0 to 1 percent. Elevation is near sea level to 500 feet. The

average annual precipitation is about 40 to 70 inches, the average annual air temperature is about 50 degrees F, and the average frost-free season is 160 to 200 days.

These soils are dysic, mesic Typic Medihemists.

Typical pedon of Mukilteo muck, about 7 miles east of Port Angeles, 1,200 feet south of the northeast corner of sec. 15, T. 30 N., R. 5 W.

Oa1—0 to 7 inches; black (5YR 2.5/1) sapric material; about 15 percent fibers, 5 percent rubbed; moderate fine and very fine granular structure; very friable; many fine and very fine roots; very strongly acid; clear smooth boundary.

Oa2—7 to 10 inches; black (5YR 2.5/1) sapric material; discontinuous layer of ashlike material; 5 percent mineral material; about 15 percent fibers, 5 percent rubbed; moderate fine and medium subangular blocky structure; very friable; many fine and very fine roots; very strongly acid; clear smooth boundary.

Oe3—10 to 22 inches; dark reddish brown (5YR 2.5/2) hemic material; about 75 percent fibers, 18 percent rubbed; moderate fine and coarse subangular blocky structure; very friable; common fine and very fine roots; very strongly acid; clear smooth boundary.

Oe4—22 to 26 inches; black (10YR 2/1) hemic material; about 75 percent fibers, 18 percent rubbed; moderate fine and medium platy structure; very friable; few very fine roots; very strongly acid; clear smooth boundary.

Oe5—26 to 36 inches; black (10YR 2/1) hemic material; about 75 percent fibers, 18 percent rubbed; moderate fine and medium platy structure; very friable; few very fine roots; very strongly acid; clear smooth boundary.

Oe6—36 to 60 inches; black (10YR 2/1) hemic material; about 75 percent fibers, 18 percent rubbed; moderate fine and medium platy structure; very friable; few very fine roots; very strongly acid.

The profile is very strongly acid or strongly acid throughout.

The surface tier has hue of 5YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. It generally has one or more layers of sapric material that is less than 15 percent rubbed fibers.

The subsurface tiers have hue of 5YR, 7.5YR, or 10YR, and they have value and chroma of 2 to 4. They are hemic material that is 18 to 50 percent rubbed fibers.

The bottom tier is similar in color to the subsurface tiers, but it generally is higher in content of fibers.

Neilton Series

The Neilton series consists of very deep, excessively drained soils on outwash terraces and terrace escarpments. These soils formed in glacial outwash. Slope is 0 to 70 percent. Elevation is near sea level to 1,600 feet. The average annual precipitation is about 30 to 60 inches, and the average annual air temperature is about 50 degrees F. The frost-free period is 160 to 200 days, and the average growing season (at 28 degrees) is 220 to 260 days.

These soils are sandy-skeletal, mixed, mesic Dystric Xerorthents.

Typical pedon of Neilton very gravelly sandy loam, 5 to 30 percent slopes (fig. 9), about 5 miles south of Port Angeles, 400 feet north and 2,000 feet west of the southeast corner of sec. 33, T. 30 N., R. 6 W.

O1—1 inch to 0; needles, leaves, and twigs.

A—0 to 6 inches; dark brown (7.5YR 3/4) very gravelly sandy loam, brown (7.5YR 5/4) dry; weak very fine granular structure; soft, very friable, slightly sticky and nonplastic; common medium roots and many fine and very fine roots; many very fine irregular and tubular pores; 40 percent pebbles; medium acid; clear smooth boundary.

Bw1—6 to 12 inches; dark yellowish brown (10YR 4/4) very gravelly loamy sand, brownish yellow (10YR 6/6) dry; weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common medium roots and many fine and very fine roots; many very fine irregular and tubular pores; 50 percent pebbles and 5 percent cobbles; medium acid; clear smooth boundary.

Bw2—12 to 19 inches; dark yellowish brown (10YR 4/4) very gravelly loamy sand, brownish yellow (10YR 6/6) dry; weak very fine subangular blocky structure; soft, friable, nonsticky and nonplastic; common fine and very fine roots; many very fine irregular and tubular pores; 40 percent pebbles and 5 percent cobbles; medium acid; clear smooth boundary.

C—19 to 60 inches; olive brown (2.5Y 4/4) extremely gravelly sand, pale yellow (2.5Y 7/4) dry; massive; loose, nonsticky and nonplastic; few fine and very fine roots; many very fine and fine irregular pores; 55 percent pebbles and 10 percent cobbles; slightly acid.

The control section is 45 to 70 percent pebbles and cobbles.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist and 5 or 6 when dry, and chroma of 2 to 4 when moist or dry. It is very cobbly sandy loam, very gravelly sandy loam, or very gravelly loamy sand. The horizon is medium acid or strongly acid.

The Bw horizon has hue of 7.5YR or 10YR, value of 3 to 5 when moist and 6 or 7 when dry, and chroma of 3 or 4 when moist and 3 to 6 when dry. It is very gravelly loamy sand, extremely gravelly loamy sand, extremely cobbly loamy sand, or extremely cobbly sand. The horizon is medium acid or strongly acid.

The C horizon has hue of 10YR or 2.5Y, value of 3 to 5 when moist and 5 to 7 when dry, and chroma of 2 to 6 when moist or dry. It is very gravelly loamy sand,

Figure 9.—Profile of Neilton very gravelly sandy loam, 5 to 30 percent slopes.

extremely cobbly loamy sand, extremely gravelly sand, extremely cobbly sand, or very gravelly sand. This horizon is slightly acid to strongly acid.

Ozette Series

The Ozette series consists of deep, moderately well drained soils on hills. These soils formed in loess and glacial till derived dominantly from sandstone and siltstone overlying compact glacial till. Slope is 5 to 35 percent. Elevation is 100 to 1,800 feet. The average annual precipitation is 80 to 120 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

These soils are medial, mesic Andaquic Haplumbrepts.

Typical pedon of Ozette silt loam, 5 to 35 percent slopes, about 2 miles north and 5 miles west of Forks, 2,600 feet south and 400 feet west of the northeast corner of sec. 34, T. 29 N., R. 14 W.

Oe—2 inches to 0; partially decomposed needles, leaves, and twigs.

A1—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, dark brown (10YR 4/3) dry; moderate very fine subangular blocky structure parting to granular; slightly hard, friable, slightly sticky and plastic; weakly smeary; many very fine and fine roots and common medium roots; many very fine and fine irregular and tubular pores; 10 percent pebbles; very strongly acid; clear smooth boundary.

A2—7 to 18 inches; dark brown (10YR 3/3) silt loam, dark brown (10YR 4/3) dry; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; weakly smeary; many very fine and fine roots and common medium roots; many very fine and fine irregular and tubular pores; 10 percent pebbles; very strongly acid; clear smooth boundary.

Bw—18 to 30 inches; dark yellowish brown (10YR 3/4) gravelly loam, light yellowish brown (10YR 6/4) dry; few fine distinct dark grayish brown (10YR 4/2) mottles, grayish brown (10YR 5/2) dry; moderate fine and medium angular blocky structure; slightly hard, friable, slightly sticky and plastic; weakly smeary; common very fine and fine roots; many very fine and fine irregular and tubular pores; 20 percent pebbles; strongly acid; clear wavy boundary.

BC—30 to 42 inches; dark yellowish brown (10YR 4/4) gravelly loam, light yellowish brown (10YR 6/4) dry; common medium distinct strong brown (7.5YR 5/6) mottles, reddish yellow (7.5YR 6/6) dry; weak fine and medium angular blocky structure; slightly hard, friable, slightly sticky and plastic; weakly smeary; few very fine and fine roots; common very fine and fine irregular pores and few very fine and fine

tubular pores; 20 percent pebbles; strongly acid; abrupt smooth boundary.

Cr—42 to 60 inches; brown (10YR 5/3) dense glacial till that crushes to gravelly loam, light gray (10YR 7/2) dry; common medium distinct strong brown (7.5YR 5/8) and dark grayish brown (10YR 4/2) mottles, reddish yellow (7.5YR 6/8) and grayish brown (10YR 5/2) dry; massive; very hard, very firm, slightly sticky and plastic; few very fine tubular pores; 30 percent pebbles; strongly acid.

The control section is 10 to 30 percent pebbles and cobbles. Depth to paralithic contact, or compact glacial till, is 40 to 60 inches or more. Mottles that have chroma of 2 or less are at a depth of less than 20 inches.

The A horizon has value of 4 or 5 when dry, and it has chroma of 3 or 4 when dry. It is strongly acid or very strongly acid.

The Bw horizon has hue of 10YR or 2.5Y, value of 3 or 4 when moist and 4 to 7 when dry, and chroma of 3 or 4 when moist or dry. It is silt loam, gravelly silt loam, loam, or gravelly loam. The horizon is strongly acid or very strongly acid.

The BC horizon has hue of 10YR or 2.5Y, and it has value of 4 to 6 when moist and 6 or 7 when dry. It is strongly acid or medium acid.

The Cr horizon has hue of 10YR or 2.5Y, value of 4 to 6 when moist and 6 or 7 when dry, and chroma of 3 to 6 when moist and 2 to 4 when dry. It is strongly acid or medium acid.

Palix Series

The Palix series consists of deep, well drained soils on foothills. These soils formed in material weathered from siltstone and very fine sandstone. Slope is 30 to 90 percent. Elevation is near sea level to 1,800 feet. The average annual precipitation is about 70 to 120 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

These soils are medial, mesic Andic Haplumbrepts.

Typical pedon of Palix loam, 30 to 65 percent slopes, about 3 miles south and 2 miles east of Clallam Bay, 2,500 feet south and 800 feet east of the northwest corner of sec. 2, T. 31 N., R. 12 W.

Oe—2 inches to 0; partially decomposed needles, leaves, and twigs.

A—0 to 17 inches; dark brown (10YR 3/3) loam, dark yellowish brown (10YR 4/4) dry; weak to moderate fine and very fine granular and subangular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; common medium roots and many fine and very fine roots; many very fine irregular and tubular pores; 20 percent soft rock fragments; very strongly acid; clear wavy boundary.

Bw—17 to 33 inches; dark yellowish brown (10YR 4/6) silty clay loam, brownish yellow (10YR 6/6) dry; weak fine and very fine subangular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; common fine and very fine roots; many very fine irregular and tubular pores; 45 percent soft rock fragments; very strongly acid; clear smooth boundary.

C—33 to 44 inches; dark yellowish brown (10YR 4/4) clay loam, very pale brown (10YR 7/4) dry; massive; slightly hard, friable, sticky and plastic; weakly smeary; few fine and very fine roots; many very fine irregular and tubular pores; 85 percent soft rock fragments; very strongly acid; clear wavy boundary.

Cr—44 inches; fractured soft siltstone.

The control section is more than 35 percent soft rock fragments. Depth to paralithic contact, or soft siltstone, is 40 to 60 inches or more.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry, and chroma of 2 or 3 when moist and 2 to 4 when dry.

The Bw horizon has hue of 7.5YR or 10YR, value of 3 to 5 when moist and 5 to 7 when dry, and chroma of 4 to 6 when moist or dry. It is clay loam or silty clay loam.

Puget Series

The Puget series consists of very deep, poorly drained soils on low terraces and flood plains. These soils have been artificially drained. They formed in recent alluvium. Slope is 0 to 3 percent. Elevation is 10 to 400 feet. The average annual precipitation is about 25 to 35 inches, the average annual air temperature is about 50 degrees F, and the average frost-free season is 170 to 200 days.

These soils are fine-silty, mixed, nonacid, mesic Aeric Fluvaquents.

Typical pedon of Puget silt loam, about 0.5 mile northwest of Carlsborg, 2,200 feet east and 700 feet south of the northwest corner of sec. 15, T. 30 N., R. 4 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; common medium distinct yellowish brown (10YR 5/4) mottles, brownish yellow (10YR 6/6) dry; weak fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; many fine and very fine roots; many fine and very fine tubular pores and common very fine irregular pores; 5 percent pebbles; slightly acid; clear smooth boundary.

Cg1—9 to 25 inches; grayish brown (2.5Y 5/2) silty clay loam, light gray (2.5Y 7/2) dry; many medium distinct dark yellowish brown (10YR 4/4) mottles, brownish yellow (10YR 6/6) dry; moderate fine and medium angular blocky structure; hard, friable, slightly sticky and plastic; common fine and very fine

roots; many fine and very fine tubular pores and common very fine irregular pores; 5 percent pebbles; slightly acid; clear smooth boundary.

Cg2—25 to 35 inches; grayish brown (2.5Y 5/2) silty clay loam, light gray (2.5Y 7/2) dry; many medium distinct dark yellowish brown (10YR 4/4) mottles and few fine distinct greenish gray (5BG 5/1) mottles, brownish yellow (10YR 6/6) dry; moderate fine and very fine angular blocky structure; hard, firm, sticky and plastic; common fine and very fine roots; common fine and very fine tubular pores and few very fine irregular pores; 5 percent pebbles; slightly acid; gradual smooth boundary.

Cg3—35 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam, light gray (2.5Y 7/2) dry; many medium distinct dark yellowish brown (10YR 4/4) mottles and few fine distinct greenish gray (5BG 5/1) mottles, brownish yellow (10YR 6/6) dry; weak fine and very fine angular blocky structure; hard, firm, sticky and plastic; few fine and very fine roots; common fine and very fine tubular pores and common very fine irregular pores; slightly acid.

The A horizon has value of 3 or 4 when moist. It is slightly acid or medium acid.

The Cg horizon has hue of 2.5Y or 5Y when moist, value of 4 or 5 when moist, and chroma of 1 or 2 when moist. It is silty clay loam or silt loam and is slightly acid or medium acid.

Queets Series

The Queets series consists of very deep, well drained soils on low river terraces and flood plains. These soils formed in silty alluvium. Slope is 0 to 5 percent. Elevation is 50 to 600 feet. The average annual precipitation is about 85 to 120 inches, and the average annual air temperature is about 51 degrees F. The average frost-free season is 160 to 190 days, and the average growing season (at 28 degrees) is 220 to 250 days.

These soils are medial, mesic Andic Dystrochrepts.

Typical pedon of Queets silt loam, about 1 mile south and 4 miles west of Forks, 1,000 feet east of the northwest corner of sec. 23, T. 28 N., R. 14 W.

Oi—1 inch to 0; needles, leaves, and twigs.

A—0 to 6 inches; dark brown (10YR 3/3) silt loam, yellowish brown (10YR 5/4) dry; moderate fine and very fine subangular blocky structure parting to granular; slightly hard, friable, slightly sticky and plastic; weakly smeary; many fine and very fine roots; many fine and very fine irregular and tubular pores; very strongly acid; gradual smooth boundary.

Bw1—6 to 16 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; moderate fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; weakly smeary; many fine and very fine roots; many fine and very fine irregular and tubular pores; very strongly acid; gradual smooth boundary.

Bw2—16 to 28 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; moderate very fine, fine, and medium angular blocky structure; slightly hard, friable, slightly sticky and plastic; weakly smeary; many fine and very fine roots; many fine and very fine irregular and tubular pores; very strongly acid; gradual smooth boundary.

BC—28 to 60 inches; olive brown (2.5Y 4/4) silt loam, light yellowish brown (2.5Y 6/4) dry; weak fine and medium angular blocky structure; slightly hard, friable, slightly sticky and plastic; weakly smeary; common fine and very fine roots; many very fine tubular pores and common very fine irregular pores; very strongly acid.

The profile is strongly acid or very strongly acid.

The A horizon has value of 3 or 4 when moist and 4 or 5 when dry, and it has chroma of 3 or 4 when moist or dry.

The Bw horizon has value of 3 or 4 when moist and 5 or 6 when dry, and it has chroma of 3 or 4 when moist. It is silt loam or very fine sandy loam.

Quillayute Series

The Quillayute series consists of very deep, well drained soils on river terraces. These soils formed in loess and old estuary deposits. Slope is 0 to 8 percent. Elevation is 80 to 350 feet. The average annual precipitation is 85 to 120 inches, and the average annual air temperature is about 51 degrees F. The average frost-free season is 160 to 190 days, and the average growing season (at 28 degrees) is 220 to 250 days.

These soils are medial, mesic Typic Dystrandepts.

Typical pedon of Quillayute silt loam, 0 to 8 percent slopes (fig. 10), about 10 miles west of Forks, 500 feet north and 400 feet west of the southeast corner of sec. 14, T. 28 N., R. 15 W.

Oi—1 inch to 0; needles, leaves, and twigs.

A1—0 to 8 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine and very fine subangular blocky structure parting to granular; slightly hard, friable, sticky and plastic; weakly smeary; many very fine, fine, and medium roots; many fine and very fine tubular and irregular pores; very strongly acid; clear smooth boundary.

A2—8 to 20 inches; very dark grayish brown (10YR 3/2) silt loam, dark brown (10YR 4/3) dry; moderate very fine, fine, and medium angular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; many very fine, fine, and medium roots; many fine and very fine tubular and irregular pores; very strongly acid; clear smooth boundary.

Figure 10.—Profile of Quillayute silt loam, 0 to 8 percent slopes.

A3—20 to 32 inches; very dark grayish brown (10YR 3/2) and very dark gray (10YR 3/1) silty clay loam, dark brown (10YR 4/3) and dark grayish brown (10YR 4/2) dry; moderate very fine, fine, and medium angular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; many fine and very fine roots and few medium roots; many fine and very fine tubular pores and many very fine irregular pores; very strongly acid; clear irregular boundary.

Bw—32 to 49 inches; yellowish brown (10YR 5/4) silty clay loam, very pale brown (10YR 7/4) dry; moderate very fine, fine, and medium angular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; common fine and very fine roots; many fine and very fine tubular pores and many very fine irregular pores; very strongly acid; clear smooth boundary.

BC—49 to 60 inches; light olive brown (2.5Y 5/4) silty clay loam, pale yellow (2.5Y 7/4) dry; weak fine and medium angular blocky structure parting to massive; slightly hard, friable, sticky and plastic; weakly smeary; few fine and very fine roots; many very fine irregular and tubular pores; strongly acid.

The A horizon has value of 3 to 6 when dry, and it has chroma of 1 to 3 when moist or dry.

The Bw horizon has value of 4 or 5 when moist and 6 or 7 when dry, and it has chroma of 3 or 4 when moist or dry. It is silty clay loam or silt loam and is strongly acid or very strongly acid.

Sadie Series

The Sadie series consists of moderately deep, moderately well drained soils on hills. These soils formed in glacial till. Slope is 0 to 35 percent. Elevation is 200 to 1,400 feet. The average annual precipitation is about 55 to 75 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

These soils are medial, mesic Andic Xerochrepts.

Typical pedon of Sadie gravelly loam, 0 to 35 percent slopes (fig. 11), about 9 miles west of Joyce, 200 feet north and 700 feet east of the southwest corner of sec. 25, T. 31 N., R. 10 W.

Oe—1 inch to 0; partially decomposed needles, leaves, and twigs.

A—0 to 4 inches; dark brown (7.5YR 3/4) gravelly loam, brown (7.5YR 5/4) dry; weak very fine granular structure and weak fine and very fine subangular blocky; soft, friable, slightly sticky and slightly plastic; weakly smeary; common medium roots and many fine and very fine roots; many very fine irregular pores and many fine and very fine tubular

Figure 11.—Profile of Sadie gravelly loam, 0 to 35 percent slopes.

pores; 15 percent pebbles and 2 percent cobbles; very strongly acid; clear smooth boundary.

Bw—4 to 19 inches; brown (7.5YR 4/4) gravelly loam, light yellowish brown (10YR 6/4) dry; weak fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; weakly smeary; common medium roots and many fine and very fine roots; many very fine irregular pores and many fine and very fine tubular pores; 15 percent pebbles and 2 percent cobbles; strongly acid; clear smooth boundary.

BC—19 to 30 inches; dark yellowish brown (10YR 4/4) gravelly loam, very pale brown (10YR 7/4) dry; common fine distinct dark yellowish brown (10YR 4/6) mottles, brownish yellow (10YR 6/6) dry; weak fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; weakly smeary; many fine and very fine roots; common very fine irregular and tubular pores; 15 percent pebbles and 2 percent cobbles; strongly acid; clear smooth boundary.

Cr1—30 to 44 inches; olive brown (2.5Y 4/4) dense glacial till that crushes to gravelly loam, pale yellow (2.5Y 7/4) dry; common medium distinct dark yellowish brown (10YR 4/6) and light brownish gray (10YR 6/2) mottles, brownish yellow (10YR 6/6) and white (10YR 8/2) dry; massive; very hard, very firm, slightly sticky and slightly plastic; few fine and very fine roots in cracks; few very fine irregular and tubular pores; 15 percent pebbles and 2 percent cobbles; medium acid; clear smooth boundary.

Cr2—44 to 60 inches; olive brown (2.5Y 4/4) dense glacial till that crushes to gravelly loam, pale yellow (2.5Y 7/4) dry; common medium distinct dark yellowish brown (10YR 4/6) mottles, brownish yellow (10YR 6/6) dry; massive; very hard, very firm, slightly sticky and slightly plastic; few very fine roots in cracks; few very fine irregular and tubular pores; 15 percent pebbles and 2 percent cobbles; medium acid.

The control section is 15 to 30 percent pebbles and some cobbles. Depth to paralithic contact, or compact glacial till, is 25 to 40 inches. Mottles that have chroma of 2 or less are in some pedons at a depth of more than 30 inches.

The A horizon has value of 5 or 6 when dry. It is strongly acid or very strongly acid.

The Bw horizon has hue of 7.5YR or 10YR, value of 6 or 7 when dry, and chroma of 4 to 6 when dry. It is mottled in some pedons. The horizon is medium acid or strongly acid.

The BC horizon has value of 4 or 5 when moist. It is medium acid or strongly acid.

Schnorbush Series

The Schnorbush series consists of very deep, well drained soils on hills. These soils formed in glacial till and residuum derived from siltstone. Slope is 0 to 80 percent. Elevation is 200 to 1,400 feet. The average annual precipitation is about 40 to 60 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 220 to 260 days.

These soils are fine-loamy, mixed, mesic Dystric Xerochrepts.

Typical pedon of Schnorbush loam, 0 to 20 percent slopes (fig. 12), about 1.5 miles northeast of Joyce, 2,000 feet north and 2,400 feet west of the southeast corner of sec. 28, T. 31 N., R. 8 W.

Oe—1 inch to 0; partially decomposed needles, leaves, and twigs.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak very fine granular structure; soft, friable, sticky and plastic; many fine and very fine roots; many fine and very fine irregular and tubular pores; 10 percent hard pebbles and 10 percent soft rock fragments; medium acid; clear smooth boundary.

Bw1—4 to 14 inches; dark yellowish brown (10YR 3/4) loam, brown (10YR 5/3) dry; weak fine and very fine subangular blocky structure; slightly hard, friable, sticky and plastic; many fine and very fine roots and few medium roots; many very fine irregular pores and many fine and very fine tubular pores; 10 percent hard pebbles and 15 percent soft rock fragments; medium acid; clear smooth boundary.

Bw2—14 to 28 inches; olive brown (2.5Y 4/4) loam, pale yellow (2.5Y 7/4) dry; weak fine and very fine subangular blocky structure; slightly hard, friable, sticky and plastic; common fine and very fine roots and few medium roots; many very fine irregular and tubular pores; 10 percent hard pebbles and 40 percent soft rock fragments; medium acid; clear smooth boundary.

C1—28 to 37 inches; light olive brown (2.5Y 5/4) silty clay loam, pale yellow (2.5Y 7/4) dry; massive; very hard, firm, sticky and plastic; common fine and very fine roots and few medium roots; many very fine irregular pores and common very fine tubular pores; 75 percent soft rock fragments; strongly acid; clear wavy boundary.

C2—37 to 60 inches; olive brown (2.5Y 4/4) loam, light yellowish brown (2.5Y 6/4) dry; massive; very hard, very firm, sticky and plastic; few fine and very fine roots; many fine and very fine irregular pores; 90 percent soft rock fragments; strongly acid.

The solum is 0 to 20 percent pebbles and cobbles. The profile is strongly acid or medium acid throughout.

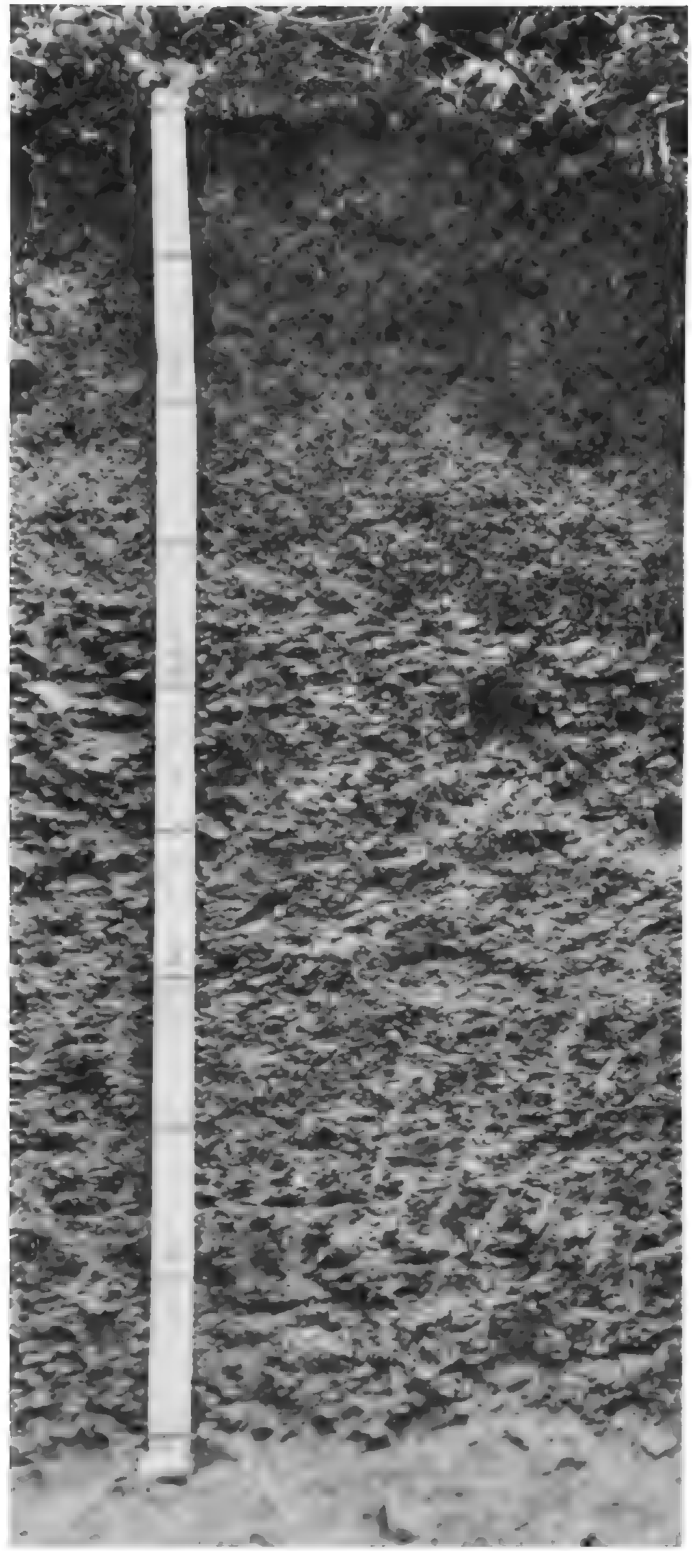


Figure 12.—Profile of Schnorbush loam, 0 to 20 percent slopes.

Some pedons have a few mottles or iron stains in the lower part of the solum and in the C horizon.

The A horizon has hue of 10YR or 2.5Y, value of 2 to 4 when moist and 4 to 7 when dry, and chroma of 2 to 4 when moist or dry.

The Bw horizon has value of 3 to 5 when moist and 5 to 7 when dry, and it has chroma of 4 to 6 when moist and 3 to 6 when dry. It is loam, clay loam, silty clay loam, gravelly loam, gravelly clay loam, or gravelly silty clay loam.

The C horizon has hue of 10YR or 2.5Y, value of 4 to 6 when moist, and chroma of 4 to 6 when moist or dry. It is loam, silt loam, or silty clay loam.

Sequim Series

The Sequim series consists of very deep, somewhat excessively drained soils on terraces and alluvial fans. These soils formed in old alluvium. Slope is 0 to 5 percent. Elevation is 20 to 300 feet. The average annual precipitation is 16 to 22 inches, the average annual air temperature is about 49 degrees F, and the average frost-free season is 170 to 200 days.

These soils are sandy-skeletal, mixed, mesic Entic Haploxerolls.

Typical pedon of Sequim very gravelly sandy loam, about 0.5 mile north of Sequim, 800 feet north and 1,300 feet west of the southeast corner of sec. 18, T. 30 N., R. 3 W.

Ap—0 to 10 inches; very dark brown (10YR 2/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) dry; weak fine and very fine granular structure; slightly hard, very friable, slightly sticky and nonplastic; many fine and very fine roots; many fine and very fine tubular and irregular pores; 30 percent pebbles and 10 percent cobbles; neutral; clear smooth boundary.

AC—10 to 23 inches; dark brown (10YR 3/3) extremely cobbly loamy sand, brown (10YR 5/3) dry; single grain; loose; many fine and very fine roots; many fine and very fine irregular pores; 40 percent pebbles and 30 percent cobbles; neutral; gradual smooth boundary.

C1—23 to 36 inches; brown (10YR 4/3) extremely cobbly sand, pale brown (10YR 6/3) dry; single grain; loose; many fine and very fine roots; many fine and very fine irregular pores; 40 percent pebbles and 30 percent cobbles; neutral; clear smooth boundary.

C2—36 to 60 inches; dark grayish brown (2.5Y 4/2) extremely cobbly sand, light brownish gray (2.5Y 6/2) dry; single grain; loose; few very fine roots; many fine and very fine irregular pores; 40 percent pebbles and 30 percent cobbles; neutral.

The control section is 60 to 80 percent pebbles and cobbles.

The A horizon has value of 2 or 3 when moist and 3 or 4 when dry. It is slightly acid or neutral.

The AC horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist and 4 to 6 when dry, and chroma of 3 or 4 when moist or dry. It is very gravelly loamy sand, very cobbly loamy sand, or extremely cobbly loamy sand. The horizon is slightly acid or neutral.

The C horizon has value of 3 or 4 when moist and 5 or 6 when dry, and it has chroma of 2 or 3 when moist or dry. It is very gravelly loamy sand, extremely gravelly loamy sand, extremely cobbly loamy sand, very gravelly sand, extremely gravelly sand, or extremely cobbly sand.

Snahopish Series

The Snahopish series consists of very deep, well drained soils on mountainsides. These soils formed in loess, residuum, and colluvium derived from sandstone. Slope is 35 to 70 percent. Elevation is 300 to 1,800 feet. The average annual precipitation is about 90 to 130 inches, the average annual air temperature is about 47 degrees F, and the average growing season (at 28 degrees) is 210 to 240 days.

These soils are medial-skeletal, mesic Andic Haplumbrepts.

Typical pedon of Snahopish very gravelly loam, 35 to 70 percent slopes, about 2 miles southeast of Lake Pleasant, 200 feet south and 300 feet west of the northeast corner of sec. 7, T. 29 N., R. 12 W.

Oe—1 inch to 0; partially decomposed needles, leaves, and twigs.

A—0 to 10 inches; dark brown (10YR 3/3) very gravelly loam, yellowish brown (10YR 5/4) dry; moderate very fine and fine subangular blocky structure parting to granular; slightly hard, friable, sticky and plastic; weakly smeary; many very fine, fine, and medium roots; many very fine and fine irregular and tubular pores; 30 percent angular pebbles and 10 percent angular cobbles; very strongly acid; clear smooth boundary.

Bw1—10 to 21 inches; dark yellowish brown (10YR 4/6) very cobbly loam, light yellowish brown (10YR 6/4) dry; moderate very fine, fine, and medium subangular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; many very fine and fine roots and common medium roots; many fine and very fine irregular and tubular pores; 20 percent angular pebbles and 20 percent angular cobbles; very strongly acid; gradual smooth boundary.

Bw2—21 to 41 inches; dark yellowish brown (10YR 4/6) very cobbly loam, light yellowish brown (10YR 6/4) dry; weak very fine, fine, and medium angular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; common very fine and fine roots and few medium roots; many very fine irregular

pores and many very fine and fine tubular pores; 30 percent angular pebbles and 20 percent angular cobbles; very strongly acid; gradual smooth boundary.

C—41 to 60 inches; dark yellowish brown (10YR 4/6) extremely cobbly loam, light yellowish brown (10YR 6/4) dry; massive; slightly hard, friable, sticky and plastic; weakly smeary; common very fine and fine roots; many very fine irregular and tubular pores; 40 percent angular pebbles and 30 percent angular cobbles; very strongly acid.

The control section is 35 to 75 percent rock fragments, of which 15 to 40 percent is angular cobbles and flagstones. The profile is very strongly acid or strongly acid throughout.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3 when moist and 4 or 5 when dry, and chroma of 2 to 4 when moist or dry.

The Bw horizon has hue of 7.5YR or 10YR, value of 3 to 5 when moist and 4 to 6 when dry, and chroma of 3 to 6 when moist and 3 or 4 when dry. It is extremely gravelly loam, very cobbly loam, extremely cobbly loam, extremely gravelly silt loam, very cobbly silt loam, or extremely cobbly silt loam.

The C horizon has hue of 10YR or 2.5Y, value of 4 to 6 when moist and 5 to 7 when dry, and chroma of 4 to 6 when moist or dry. It is very gravelly loam, very cobbly loam, extremely cobbly loam, or extremely cobbly silt loam.

Solduc Series

The Solduc series consists of very deep, somewhat excessively drained soils on outwash terraces. These soils formed in glacial outwash that has some loess and volcanic ash in the upper part. Slope is 0 to 5 percent. Elevation is 50 to 800 feet. The average annual precipitation is about 80 to 120 inches, the average annual air temperature is about 50 degrees F, and the average growing season (at 28 degrees) is 220 to 250 days.

These soils are medial-skeletal, mesic Humic Haplorthods.

Typical pedon of Solduc very gravelly sandy loam, about 3 miles north of Forks, 1,400 feet south and 2,400 feet west of the northeast corner of sec. 29, T. 29 N., R. 13 W.

Oi—2 inches to 0; needles, leaves, and twigs.

Bhs1—0 to 7 inches; dark reddish brown (5YR 3/2) very gravelly sandy loam, reddish brown (5YR 4/3) dry; weak very fine subangular blocky structure and weak very fine and fine granular; slightly hard, friable, slightly sticky and slightly plastic; weakly smeary; many very fine, fine, and medium roots; many very fine and fine irregular and tubular pores; 40 percent pebbles and 5 percent cobbles; very strongly acid; clear smooth boundary.

Bhs2—7 to 12 inches; dark reddish brown (5YR 3/4) very gravelly sandy loam, dark brown (7.5YR 4/4) dry; weak fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; weakly smeary; many very fine, fine, and medium roots; many fine and very fine irregular and tubular pores; 50 percent pebbles and 10 percent cobbles; very strongly acid; clear smooth boundary.

Bs—12 to 30 inches; dark brown (7.5YR 4/4) very gravelly sandy loam, reddish yellow (7.5YR 6/6) dry; weak very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; weakly smeary; many very fine and fine roots and common medium roots; many fine and very fine irregular and tubular pores; 50 percent pebbles and 10 percent cobbles; very strongly acid; clear smooth boundary.

2C1—30 to 52 inches; dark yellowish brown (10YR 4/4) extremely gravelly loamy sand, brownish yellow (10YR 6/6) dry; single grain; loose; common fine and very fine roots and few medium roots; many fine and very fine irregular pores and common very fine tubular pores; 50 percent pebbles and 20 percent cobbles; very strongly acid; clear smooth boundary.

2C2—52 to 60 inches; dark grayish brown (2.5Y 4/2) extremely gravelly sand, light olive brown (2.5Y 5/4) dry; single grain; loose; common fine and very fine roots; many fine and very fine irregular pores; 50 percent pebbles and 20 percent cobbles; very strongly acid.

The control section is 50 to 70 percent rock fragments, most of which are pebbles and cobbles. The profile is strongly acid or very strongly acid throughout.

The Bhs horizon has value of 2 or 3 when moist and 4 or 5 when dry, and it has chroma of 2 to 4 when moist or dry.

The Bs horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist and 4 to 6 when dry, and chroma of 4 to 6 when moist or dry. It is very gravelly sandy loam, extremely gravelly sandy loam, or very gravelly loam.

The 2C horizon has value of 3 or 4 when moist, and it has chroma of 2 to 6 when moist. It is extremely gravelly loamy sand, extremely cobbly loamy sand, extremely gravelly sand, or extremely cobbly sand.

Solleks Series

The Solleks series consists of moderately deep, well drained soils on mountainsides. These soils formed in residuum and colluvium derived from sandstone and conglomerate. Slope is 60 to 90 percent. Elevation is 600 to 2,000 feet. The average annual precipitation is about 100 to 140 inches, the average annual air

temperature is about 45 degrees F, and the average growing season (at 28 degrees) is 200 to 240 days.

These soils are medial-skeletal, mesic Andic Haplumbrepts.

Typical pedon of Solleks very gravelly loam, 60 to 90 percent slopes, about 4 miles south and 10 miles east of Lake Pleasant, 3,400 feet south and 2,000 feet west of the northeast corner of sec. 15, T. 29 N., R. 11 W.

Oe—1 inch to 0; partially decomposed needles, leaves, and twigs.

A—0 to 10 inches; dark brown (10YR 3/3) very gravelly loam, brown (10YR 5/3) dry; weak fine and very fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; weakly smeary; many fine and very fine roots and common medium roots; many fine and very fine irregular and tubular pores; 40 percent angular pebbles and 10 percent angular cobbles; very strongly acid; gradual smooth boundary.

Bw1—10 to 22 inches; dark yellowish brown (10YR 4/4) very cobbly loam, light yellowish brown (10YR 6/4) dry; weak fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; weakly smeary; many fine and very fine roots and common medium roots; many fine and very fine irregular and tubular pores; 30 percent angular pebbles and 30 percent angular cobbles; strongly acid; gradual smooth boundary.

Bw2—22 to 33 inches; dark yellowish brown (10YR 4/4) extremely cobbly loam, light yellowish brown (10YR 6/4) dry; weak fine and very fine angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; weakly smeary; common fine and very fine roots and few medium roots; many fine and very fine irregular pores and common fine and very fine tubular pores; 30 percent angular pebbles and 40 percent angular cobbles; strongly acid; clear smooth boundary.

R—33 inches; fractured sandstone.

The control section averages 60 to 75 percent rock fragments consisting of angular pebbles, angular cobbles, channers, and flagstones. Depth to fractured sandstone is 20 to 40 inches. The profile is strongly acid or very strongly acid throughout.

The A horizon has value of 4 or 5 when dry, and it has chroma of 2 or 3 when moist or dry.

The Bw horizon has hue of 10YR or 2.5Y, value of 3 or 4 when moist and 5 to 7 when dry, and chroma of 3 to 6 when moist and 4 to 6 when dry. It is very gravelly silt loam, extremely cobbly silt loam, very cobbly loam, or extremely cobbly loam.

Tealwhit Series

The Tealwhit series consists of very deep, poorly drained soils on low terraces. These soils formed in alluvium. Slope is 0 to 5 percent. Elevation is 20 to 1,200 feet. The average annual precipitation is about 80 to 140 inches, the average annual air temperature is about 49 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

These soils are fine, mixed, acid, mesic Aeric Haplaquepts.

Typical pedon of Tealwhit silt loam, 0 to 5 percent slopes, about 5 miles east of the south end of Lake Ozette, 1,800 feet south and 1,400 feet west of the northeast corner of sec. 8, T. 29 N., R. 14 W.

Oe—2 inches to 0; partially decomposed needles, leaves, and twigs.

A—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, dark brown (10YR 4/3) dry; moderate fine and very fine granular structure and moderate very fine subangular blocky; slightly hard, friable, sticky and plastic; many very fine, fine, and medium roots; many fine and very fine tubular and irregular pores; very strongly acid; clear smooth boundary.

Bg1—6 to 11 inches; dark grayish brown (10YR 4/2) silty clay loam, pale brown (10YR 6/2) dry; common medium prominent yellowish brown (10YR 5/8) mottles, brownish yellow (10YR 6/8) dry; moderate very fine, fine, and medium angular blocky structure; hard, firm, sticky and very plastic; many fine and very fine roots; many very fine tubular and irregular pores; very strongly acid; clear wavy boundary.

Bg2—11 to 25 inches; olive (5Y 5/3) silty clay loam, light gray (5Y 7/2) dry; many medium prominent yellowish brown (10YR 5/6) and light brownish gray (2.5Y 6/2) mottles, brownish yellow (10YR 6/8) and light gray (2.5Y 7/2) dry; weak very fine, fine, and medium angular blocky structure; hard, firm, sticky and very plastic; few fine and very fine roots; many very fine tubular pores and common very fine irregular pores; very strongly acid; gradual smooth boundary.

Bg3—25 to 38 inches; olive (5Y 5/3) silty clay loam, light gray (5Y 7/2) dry; many medium prominent dark yellowish brown (10YR 4/6) and light brownish gray (2.5Y 6/2) mottles, brownish yellow (10YR 6/6) and light gray (2.5Y 7/2) dry; weak fine and medium angular blocky structure; hard, firm, sticky and very plastic; few very fine roots; many very fine tubular pores and common very fine irregular pores; very strongly acid; clear smooth boundary.

2Cg—38 to 60 inches; olive (5Y 5/3) very fine sandy loam, light gray (5Y 7/2) dry; many medium prominent dark yellowish brown (10YR 4/6) and light brownish gray (2.5Y 6/2) mottles, brownish yellow (10YR 6/6) and light gray (2.5Y 7/2) dry; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; very strongly acid.

The A horizon has value of 2 or 3 when moist, and it has chroma of 2 or 3 when moist or dry.

The Bg horizon has hue of 10YR to 5Y, value of 3 to 5 when moist and 6 or 7 when dry, and chroma of 2 to 4 when moist or dry. It has many to common, distinct or prominent mottles.

The 2C horizon has hue of 10YR to 5Y, value of 4 to 6 when moist and 6 or 7 when dry, and chroma of 1 to 3 when moist or dry. It has few to many distinct or prominent mottles. The horizon is very fine sandy loam to silty clay and is medium acid to very strongly acid.

Terbies Series

The Terbies series consists of deep, well drained soils on mountainsides. These soils formed in residuum and colluvium derived from sandstone, siltstone, and conglomerate. Slope is 30 to 85 percent. Elevation is 800 to 2,000 feet. The average annual precipitation is about 40 to 70 inches, the average annual air temperature is about 46 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

The soils are loamy-skeletal, mixed, mesic Dystric Xerochrepts.

Typical pedon of Terbies very gravelly sandy loam, 30 to 65 percent slopes (fig. 13), about 4 miles south and 3 miles east of Port Angeles, 1,200 feet east and 400 feet south of the northwest corner of sec. 6, T. 29 N., R. 5 W.

Oi—2 inches to 1 inch; needles, leaves, and twigs.

Oa—1 inch to 0; partially decomposed needles, leaves, and twigs.

A—0 to 3 inches; dark brown (10YR 4/3) very gravelly sandy loam, very pale brown (10YR 7/3) dry; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine and very fine irregular and tubular pores; 50 percent angular pebbles; medium acid; clear smooth boundary.

Bw1—3 to 11 inches; dark yellowish brown (10YR 4/6) very gravelly sandy loam, very pale brown (10YR 7/4) dry; weak very fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine and very fine irregular and tubular pores; 55 percent angular pebbles; medium acid; gradual smooth boundary.

Bw2—11 to 23 inches; dark yellowish brown (10YR 4/6) extremely gravelly sandy loam, very pale brown (10YR 7/4) dry; weak very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many fine and very fine irregular pores and many very fine tubular pores; 50 percent angular pebbles and 15 percent flat sandstone fragments; medium acid; gradual smooth boundary.

BC—23 to 33 inches; dark yellowish brown (10YR 4/4) extremely channery sandy loam, very pale brown

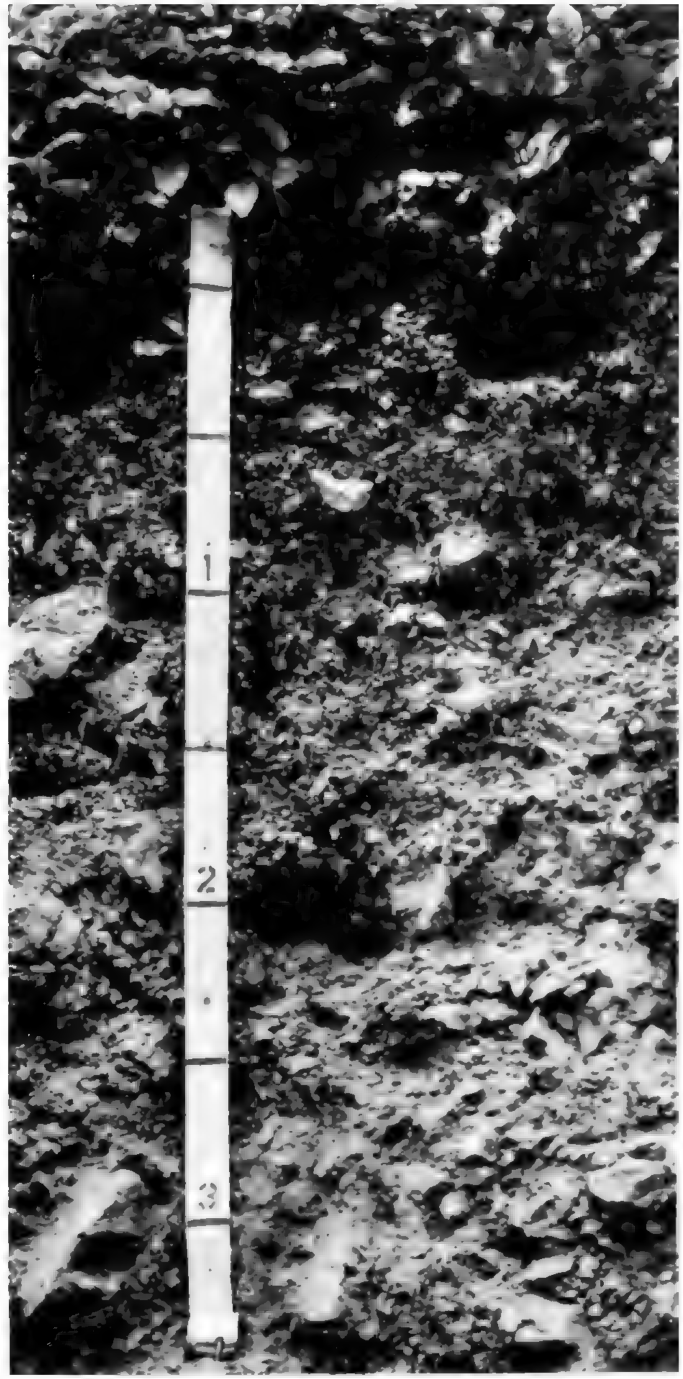


Figure 13.—Profile of Terbies very gravelly sandy loam, 30 to 65 percent slopes.

(10YR 7/3) dry; weak fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; many fine and very fine irregular pores and common

very fine tubular pores; 50 percent angular pebbles and 30 percent flat sandstone fragments; strongly acid; gradual smooth boundary.

C—33 to 45 inches; light olive brown (2.5Y 5/4) extremely channery sandy loam, pale yellow (2.5Y 7/4) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine roots; common fine and very fine irregular pores and common very fine tubular pores; 40 percent angular pebbles, 20 percent channers, and 20 percent flagstones; strongly acid; abrupt wavy boundary.

R—45 inches; fractured sandstone.

The control section is 40 to 80 percent sandstone, siltstone, or conglomerate fragments, including angular pebbles, angular cobbles, channers, and flagstones. Depth to fractured bedrock is 40 to 60 inches or more.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist and 6 or 7 when dry, and chroma of 3 or 4 when moist and 2 to 4 when dry. It is slightly acid to strongly acid.

The Bw horizon has hue of 7.5YR or 10YR, value of 3 or 4 when moist and 6 or 7 when dry, and chroma of 4 to 6 when moist or dry. It is very gravelly sandy loam, extremely gravelly sandy loam, very gravelly loam, very channery loam, or extremely channery loam. The horizon is strongly acid or medium acid.

The BC horizon, where present, has hue of 7.5YR or 10YR, value of 4 or 5 when moist and 6 or 7 when dry, and chroma of 4 to 6 when moist and 3 to 6 when dry. It is very gravelly sandy loam, extremely gravelly sandy loam, extremely channery sandy loam, or extremely channery loam. The horizon is strongly acid or medium acid.

The C horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5 when moist and 6 or 7 when dry, and chroma of 4 to 6 when moist or dry. It is extremely gravelly sandy loam, extremely channery sandy loam, extremely channery loam, extremely flaggy loam, or extremely gravelly loamy sand. The horizon is strongly acid or medium acid.

Wellman Series

The Wellman series consists of very deep, well drained soils on outwash terraces. These soils formed in loess and glacial outwash. Slope is 0 to 5 percent. Elevation is 150 to 200 feet. The average annual precipitation is about 90 to 100 inches, the average annual air temperature is about 50 degrees F, and the average frost-free season is 160 to 190 days.

These soils are medial over loamy-skeletal, mixed, mesic Typic Dystrandepts.

Typical pedon of Wellman gravelly silt loam, about 6 miles west of Forks, 1,200 feet north and 1,000 feet west of the southeast corner of sec. 5, T. 28 N., R. 14 W.

A1—0 to 7 inches; black (10YR 2/1) gravelly silt loam, very dark grayish brown (10YR 3/2) dry; moderate fine and very fine granular structure parting to subangular blocky; slightly hard, friable, slightly sticky and plastic; weakly smeary; many fine and very fine roots; many fine and very fine irregular and tubular pores; 20 percent pebbles; very strongly acid; gradual smooth boundary.

A2—7 to 14 inches; black (10YR 2/1) gravelly silt loam, very dark grayish brown (10YR 3/2) dry; moderate fine and very fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; weakly smeary; many fine and very fine roots; many very fine irregular pores and many fine and very fine tubular pores; 15 percent pebbles; very strongly acid; gradual smooth boundary.

A3—14 to 21 inches; very dark brown (10YR 2/2) gravelly silt loam, very dark grayish brown (10YR 3/2) dry; moderate fine and very fine subangular blocky structure; slightly hard, friable, sticky and plastic; weakly smeary; many fine and very fine roots; many very fine irregular pores and many fine and very fine tubular pores; 25 percent pebbles; strongly acid; clear smooth boundary.

2Bw—21 to 30 inches; dark yellowish brown (10YR 3/4) extremely gravelly sandy loam, yellowish brown (10YR 5/4) dry; weak very fine subangular blocky structure; soft, friable, slightly sticky and nonplastic; many very fine roots; many fine and very fine irregular pores; 60 percent pebbles and 10 percent cobbles; strongly acid; gradual smooth boundary.

2C—30 to 60 inches; dark brown (7.5YR 4/4) extremely gravelly sand, yellowish brown (10YR 5/4) dry; single grain; loose; common very fine roots; many fine and very fine irregular pores; 60 percent pebbles and 10 percent cobbles; strongly acid.

The upper part of the control section averages 15 to 35 percent pebbles and cobbles. Depth to the 2C horizon is 30 to 40 inches. The medial layer is 21 to 30 inches thick. The umbric epipedon is 21 to 27 inches thick. The profile is strongly acid or very strongly acid throughout.

The A horizon has hue of 5YR to 10YR, and it has chroma of 1 or 2 when dry.

The 2Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry, and chroma of 2 to 4 when moist or dry. It is extremely gravelly sandy loam or extremely gravelly loam.

The 2C horizon has hue of 7.5YR or 10YR, and it has value of 3 or 4 when moist. It is extremely gravelly sand or extremely gravelly loamy sand.

Yeary Series

The Yeary series consists of moderately deep, moderately well drained soils on hills. These soils formed

in reworked marine sediment overlying compact glacial till. Slope is 0 to 35 percent. Elevation is 200 to 1,500 feet. The average annual precipitation is about 20 to 35 inches, and the average annual air temperature is about 49 degrees F. The average frost-free season is 160 to 200 days, and the average growing season (at 28 degrees) is 210 to 260 days.

These soils are fine-loamy, mixed, mesic Dystric Xerochrepts.

Typical pedon of Yeary gravelly loam, 0 to 15 percent slopes, about 5 miles south and 2 miles east of Sequim, 1,700 feet north and 1,700 feet west of the southeast corner of sec. 16, T. 29 N., R. 3 W.

Oi—1.5 inches to 0.5 inch; needles, leaves, and twigs.

Oe—0.5 inch to 0; partially decomposed needles, leaves, and twigs.

A—0 to 7 inches; dark brown (10YR 4/3) gravelly loam, very pale brown (10YR 7/3) dry; weak very fine subangular blocky structure and weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; many fine and very fine irregular and tubular pores; 15 percent pebbles; medium acid; abrupt smooth boundary.

Bw1—7 to 13 inches; yellowish brown (10YR 5/4) gravelly loam, very pale brown (10YR 7/3) dry; few fine distinct yellowish brown (10YR 5/6) mottles, brownish yellow (10YR 6/6) dry; weak fine and very fine angular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; common fine and very fine roots; many very fine irregular pores and many fine and very fine tubular pores; 15 percent pebbles; medium acid; clear smooth boundary.

Bw2—13 to 19 inches; yellowish brown (10YR 5/4) gravelly clay loam, very pale brown (10YR 7/3) dry; few fine distinct dark yellowish brown (10YR 4/6) mottles, brownish yellow (10YR 6/6) dry; weak very fine, fine, and medium angular blocky structure; hard, firm, sticky and plastic; few fine and very fine roots; common very fine irregular pores and few fine and very fine tubular pores; 20 percent pebbles; medium acid; clear smooth boundary.

Bw3—19 to 29 inches; yellowish brown (10YR 5/4) gravelly clay loam, very pale brown (10YR 7/3) dry; common medium distinct dark yellowish brown (10YR 4/4) mottles, light yellowish brown (10YR 6/4) dry; weak medium and fine angular blocky structure; very hard, firm, sticky and plastic; few fine and very fine roots; common very fine irregular pores and few very fine tubular pores; 15 percent pebbles; medium acid; gradual smooth boundary.

Bw4—29 to 38 inches; yellowish brown (10YR 5/4) gravelly clay loam, very pale brown (10YR 7/3) dry; common medium distinct dark yellowish brown (10YR 4/6) mottles, brownish yellow (10YR 6/6) dry; weak medium and fine angular blocky structure; very hard, firm, sticky and plastic; few fine and very fine roots; few very fine irregular and tubular pores; 15 percent pebbles; medium acid; clear smooth boundary.

Cr—38 to 60 inches, olive brown (2.5Y 4/4) dense glacial till that crushes to loam, light yellowish brown (2.5Y 6/4) dry; massive; very hard, firm, slightly sticky and slightly plastic; few very fine irregular pores; 5 percent pebbles; slightly acid.

The control section is 5 to 20 percent pebbles and cobbles. Depth to paralithic contact, or compact glacial till, is 20 to 40 inches.

The A horizon has value of 3 or 4 when moist and 6 or 7 when dry, and it has chroma of 2 or 3 when moist or dry. It is slightly acid to strongly acid.

The Bw horizon has hue of 10YR or 2.5Y, value of 4 to 6 when moist and 6 or 7 when dry, and chroma of 2 to 4 when moist or dry. It is loam, gravelly loam, clay loam, or gravelly clay loam. The horizon is slightly acid to strongly acid.

The Cr horizon has hue of 10YR or 2.5Y, value of 4 to 6 when moist and 6 or 7 when dry, and chroma of 2 to 4 when moist or dry. It is dense glacial till that crushes to loam, gravelly loam, clay loam, or gravelly clay loam. The horizon is slightly acid or neutral.

Zeeka Series

The Zeeka series consists of moderately deep, somewhat poorly drained soils on hills. These soils formed in loess and glacial till overlying compact glacial till. Slope is 5 to 25 percent. Elevation is 100 to 800 feet. The average annual precipitation is 80 to 100 inches, the average annual air temperature is about 48 degrees F, and the average growing season (at 28 degrees) is 210 to 250 days.

These soils are medial mesic Aquic Dystrochrepts.

Typical pedon of Zeeka silt loam, 5 to 25 percent slopes, about 4 miles north of Lake Ozette, 1,600 feet north and 2,500 feet west of the southeast corner of sec. 8, T. 31 N., R. 15 W.

Oi—6 to 4 inches; needles, leaves, and twigs.

Oe—4 inches to 0; decomposed needles, leaves, and twigs; many very fine, fine, and medium roots.

A—0 to 6 inches; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) dry; few fine and medium distinct grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) mottles, light gray (2.5Y 7/2) and brownish yellow (10YR 6/6) dry; many very dark brown (10YR 2/2) organic coatings on faces of peds; moderate fine and medium angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; weakly

smeary; many fine and very fine roots; 10 percent pebbles; extremely acid; clear smooth boundary.

Bw1—6 to 14 inches; dark brown (10YR 4/3) and brown (10YR 5/3) silt loam, brown (10YR 5/3) and pale brown (10YR 6/3) dry; many medium prominent yellowish brown (10YR 5/8) mottles and common fine distinct grayish brown (2.5Y 5/2) mottles, brownish yellow (10YR 6/8) and light gray (2.5Y 7/2) dry; many very dark brown (10YR 2/2) organic coatings on faces of peds; moderate fine and medium angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; weakly smeary; common fine and very fine roots; many very fine irregular and tubular pores; 10 percent pebbles; extremely acid; clear smooth boundary.

Bw2—14 to 26 inches; brown (10YR 4/3) and olive brown (2.5Y 4/4) gravelly silt loam, light yellowish brown (2.5Y 6/4) dry; common medium distinct light olive brown (2.5Y 5/6) and grayish brown (2.5Y 5/2) mottles, olive yellow (2.5Y 6/6) and light gray (2.5Y 7/2) dry; few very dark brown (10YR 2/2) organic coatings on faces of peds; moderate fine and medium angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; weakly smeary; few fine and very fine roots; many very fine irregular pores and common very fine tubular pores; 20 percent pebbles and 10 percent cobbles; very strongly acid; abrupt smooth boundary.

Cr—26 inches; olive brown (2.5Y 4/4) compact glacial till that crushes to gravelly loam, pale yellow (10YR 7/4) dry; common medium distinct dark yellowish brown (10YR 4/6) and light olive gray (5Y 6/2) mottles, brownish yellow (10YR 6/6) and white (5Y 8/2) dry; massive; very hard, very firm, sticky and plastic; few very fine irregular and tubular pores; 20 percent pebbles and 5 percent cobbles; very strongly acid.

Depth to paralithic contact, or compact glacial till, is 20 to 40 inches. Mottles that have chroma of 2 or less are at a depth of less than 20 inches. The control section is 10 to 30 percent pebbles and 0 to 5 percent cobbles.

The A horizon has value of 2 to 4 when moist and 4 to 6 when dry, and it has chroma of 2 or 3 when moist or dry.

The Bw horizon has value of 4 or 5 when moist and 5 to 7 when dry. It is silt loam or gravelly silt loam and is extremely acid or very strongly acid.

Formation of the Soils

Soil is a natural three-dimensional body on the Earth's surface capable of supporting plants. Its characteristics and properties are determined by physical, biological, and chemical processes that result from the interaction of the following soil forming factors: time, parent material, climate, living organisms, and topography (*8*).

As a soil forms under the influence of these factors, it progresses through various stages of development. As an example of soil development in the survey area, the following model is useful: In this area, we can assume unweathered, moderately coarse textured parent material was exposed as the continental ice sheet melted and that the climate has been conducive to soil development most of the intervening period. Soil development began when organic matter accumulated from the first colonizing plants that occupied the soil surface. At this initial stage of development, little alteration of the parent material occurred other than organic matter enrichment of the surface layer. Such a very youthful soil is classified as an Entisol.

As development progresses, more organic matter accumulates and the soil micro-organism population increases. Rate of weathering of the mineral fraction also increases as carbon dioxide and other acid-forming compounds are produced. With weathering comes translocation, and clay and other weathering products are formed and moved downward within the soil profile. Oxidation of iron-bearing minerals gives the soil a reddish color. Soil structure begins to develop, and a cambic horizon is formed. At this stage of development, soils are young and are classified as Inceptisols, as most soils in the survey area are now classified.

With additional time and continued weathering, more clay is formed and the downward movement of clay continues. Eventually, sufficient clay accumulates in the B horizon to form an argillic horizon. At this stage of maturity, soils are classified as Alfisols.

As tens of thousands of years pass and the soil profile becomes increasingly more weathered, bases are lost from the soil system at a faster rate than replacement from weathering products. At this stage, the argillic horizon is still highly developed, but its percentage of base saturation has decreased significantly. At this juncture, soils are relatively old and are classified as Ultisols.

Although soil formation in this illustration is represented as a simple progression in nature, it is much more complex and interaction among soil forming factors is complex. For example, throughout the period of soil formation, vegetation will change. Initially, the soil material contained little organic matter. It consisted almost entirely of gravel, sand, and silt, which are products of mechanical disintegration. Clay, primarily a product of chemical weathering, has not yet formed in significant amounts. Without clay and nitrogen from organic matter and with a relatively low available water capacity, colonizing vegetation has to be capable of surviving under relatively harsh conditions. Red alder could have been such a species, because it has the capability of synthesizing nitrogen and it dominates the vegetation on newly accumulated soil material. As soils develop, so do their ability to supply moisture and nutrients. This change in soil properties enables soils to support more exacting species.

In general terms, the influence of each soil forming factor on soil development can be inferred by comparing morphological properties of soils along transects that represent changes in soil forming factors. Segregating individual factors and identifying each with a specific influence is very difficult because the five factors interact dynamically. Often, the influence of a factor is quite subtle and cannot be readily discerned by field observations; however, the more obvious trends among soils can be described and associated with one of the soil forming factors.

In Clallam County, continuity in the east-west geologic formations provides relatively uniform parent material that transects a uniform east-to-west increase in precipitation. Ranges in precipitation can be correlated with differences in soils and vegetation. Douglas-fir is the dominant species in areas receiving less than 70 inches of precipitation annually, and western hemlock is dominant in areas receiving more than 70 inches. Comparing soils on river terraces of different ages demonstrates the effect of time on soil development. The influence of relief is the most apparent and simple to demonstrate in terms of soil erodibility and accumulation of runoff and the effect these factors have on soil development.

Time

Time refers to elapsed time since deposition of soil forming material, exposure of material to soil forming

processes, or formation of a soil landscape. Weathering of parent material and development of soil characteristics are time dependent, and the time required for weathering and soil development is variable. A comparison of soils based on chronology of geomorphic events is often more meaningful than attempting to identify differences resulting from age.

The bedrock in the survey area began as sediment and igneous rock deposited beneath the Pacific Ocean as much as 50 million years ago. The sediment ranges in size from very fine clay and silt to pebbles and cobbles transported to the ocean floor in slurries called density currents (*27, 30*). During this period of sediment accumulation, molten basalt poured onto the ocean floor to form a thick stack of pillow lavas. Under pressure from the overlying material and water, the deeply buried sediment was gradually transformed into siltstone, sandstone, and conglomerate according to the particle-size of the various layers (*28*).

Soon after and perhaps even during the accumulation of these sedimentary and igneous rocks, very slow movements and collisions between huge plates of the Earth's crust began to squeeze, deform, and fold the horizontally bedded rock. At the point of collision between the ocean plate and the continental plate, uplift and further deformation of the previously submerged rock formations occurred. This process, known as plate tectonics, is responsible for the structural formation of the Olympic Mountains.

Uplifted bedrock became the landforms and parent material for most of the soils in this survey area. Sandstone and siltstone of the Twin Rivers and Aldwell Formations became the parent material for the Palix, Schnorbush, and Terbies soils. Sandstone of the Western Olympic Lithic Assemblage provided the parent material for the Ilwaco, Snahopish, and Solleks soils (*31*).

The bedrock-dominated landscape was overridden by alpine and continental glaciers. The oldest established age for coastal Pleistocene or "ice age" glacial deposits is about 71,000 years. Earlier Pleistocene deposits exist, but the dates of deposition are not known other than that they were deposited sometime during the 1.5 million years of Pleistocene time (*29*).

The most recent glaciation during which continental and alpine glaciers occupied western Washington is the Fraser Glaciation, which began about 18,000 years ago. Glacial drift deposited during this period covered or mixed previous glacial deposits and became the landforms and parent material for many of the soils in the survey area (*16*).

The Fraser Glaciation is divided into three stages representing periods of glacial deposition and an interstade representing a period of nonglacial deposition. During three of these periods deposition occurred in the survey area.

The Evans Creek Stade was the earliest and most brief period of glacial deposition during the Fraser Glaciation. During this period, large Olympic alpine glaciers reached their maximum extent in the valleys of the Calawah and Bogachiel Rivers. The northern extent of the alpine deposits is roughly indicated by the channels of the Soleduck and Quillayute Rivers. The glacial drift is typically moraine and stratified deposits containing rock native to the Olympic Mountains (*3, 14, 24*). Till from alpine glaciers provided the parent material for areas of the Ozette soils in the southwestern part of the survey area, and glacial outwash contributed material for the Klone and Solduc soils.

The last major advance of the continental ice sheet into the survey area occurred during the Vashon Stade. Ice entered Clallam County beginning about 15,000 to 17,000 years ago. The Vashon ice reworked or covered glacial drift deposited during the earlier Salmon Springs Stade, about 35,000 years ago. The southernmost extent of the Vashon ice is roughly the present channels of the Quillayute and Soleduck Rivers. Recessional outwash from the continental glacier mixed with outwash from the alpine glaciers forming a large stratified deposit of mixed outwash beginning in the upper Soleduck Valley and extending to the Pacific Ocean. This deposit became the parent material for the Solduc soils and some areas of the Klone soils.

The massive layer of Vashon ice and incorporated debris, as much as 3,000 to 4,000 feet thick in the survey area, drastically modified existing landforms and deposited others. Meltwater streams, confined by the glacier-created lakes, trapped fine lacustrine silt and clay. As the glacier melted, about 13,000 years ago, it left a landscape dominated by till plains and outwash terraces of relatively uniform age. The drift became the parent material for soils that formed in glacial till, such as the Clallam, Elwha, and Ozette soils, and for soils that formed in outwash, such as the Hoypus, Neilton, and Solduc soils.

A relatively warmer period, the Everson Interstade, began about 13,000 years ago. As the huge ice sheet gradually melted, water released from the ice raised the sea level. Seawater inundated the lower parts of the landscape and eventually was able to float the gradually thinning ice. Everson glaciomarine drift, which consists of silt and clay with occasional pebbles, accumulated in seawater beneath floating ice. This deposit became the parent material for the Agnew soils. Deposition of the Everson Glaciomarine Drift ended with a drop in the relative sea level and disappearance of floating ice about 11,000 years ago.

The Everson Interstade ended with a relatively rapid lowering of the sea level to roughly its present position over a period of approximately 1,000 to 1,500 years. The sea level lowering process included periods of emergence and submergence of coastal landscapes by as much as 500 to 700 feet (*15*). These fluctuations

created estuarine environments that trapped sediment that later became parent material for the Quillayute soils. As the sea level fell, downcutting and erosion by nearby rivers created the terrace known as the Quillayute Prairie.

During the period when the sea level dropped about 10,000 to 11,000 years ago, a broad coastal plain along the Pacific Ocean was exposed and lay bare of vegetation. This area served as a source for loess. Much of the coastal area was covered by loess deposits, some as much as 15 feet thick.

The final major event that contributed new mineral parent material in the survey area was the eruption of Mount Mazama in southern Oregon about 6,600 years ago. A thin layer of volcanic ash from this eruption contributed to the development of identifiable ash-related soil properties in the Clallam Variant. The thin ash layer can be seen in organic deposits near Sequim (*20*).

Since glaciation, landforms have been modified by mass wasting, surface erosion, and deposition. Foothills and mountains in this area were mostly covered with ice during the Fraser Glaciation. The glacier scoured and removed from the mountains the existing surface material, which was commonly replaced with glacial drift. The process of glacial scour and erosion of drift from steep slopes exposed fresh parent material. The mountainous landforms and the parent rock are relatively old; however, the soils have formed in unweathered material exposed since the last glaciation resulting in bedrock derived soils with ages similar to soils developed in recently deposited glacial drift.

Eroded materials transported by water were often deposited as alluvial terraces along major rivers. Coarse alluvial deposits are most typical in large river systems such as that of the Dungeness. Relatively fine sediment was also deposited on the lower terraces at the Bogachiel, Quillayute, and Soleduck Rivers during periods of flooding.

Soil formation has been taking place in the material deposited by the alpine glaciers in the survey area for roughly 18,000 years. Soil formation has been taking place for 13,000 years in the areas covered by the continental glacier. Marine sediment and most alluvium, loess, and volcanic ash in the survey area have been involved in soil formation for 7,000 to 12,000 years. On a geologic time scale, the soils in the survey area are young.

The influence of time on soil development can be illustrated by comparing soils that formed in alluvium on river terraces of different ages. The Hoh, Queets, and Calawah soils, on older terraces, provide an opportunity for this comparison.

The Hoh soils formed in the youngest parent material on the lowest terrace positions and are subject to flooding. These alluvial soils are a few hundred years old and consist of silt loam and fine sandy loam with strata of loamy sand and sand (*17*).

The Queets soils occupy a higher terrace adjacent to the Hoh soils. Queets soils are rarely flooded. These alluvial soils are estimated to be about 800 years old. They are silt loam and very fine sandy loam.

The Calawah soils formed in the oldest parent material on the highest terrace positions. These alluvial soils are estimated to be about 17,000 years old. They are silt loam and silty clay loam. The Calawah soils have been influenced by loess deposition.

The overstory vegetation is dominantly western hemlock and Sitka spruce on the Queets soils, western hemlock on the Calawah soils, and red alder on the Hoh soils. The kind of overstory is a function of the stage of soil development, drainage, and available water capacity. Large areas of red alder also grow on the Queets soils. The topographic and climatic factors that affect these soils are very similar. The soils are all generally classified as well drained. The most obvious time-related feature common to these three soils is the thickness of the surface layer. Assuming the effects of the other soil forming factors are constant, the amount of accumulation of organic material necessary for the formation of the surface layer is time dependent. The amount of accumulation and therefore the thickness of the surface layer increases with time. This is best demonstrated by comparing the younger Queets soils to the older Calawah soils. The surface layer of the Queets soils is about 6 inches thick compared to about 14 inches for the older Calawah soils. The parent material of the Hoh soils is dark colored; therefore, the age difference based on a comparison of surface layer thickness is less apparent.

Another soil feature that can be considered time dependent is the presence or absence of a subsurface horizon and its degree of development. Cambic horizons are subsurface horizons in which soil particles have formed peds, referred to as soil structure. The peds are held together by organic binders consisting of residue from microbial decomposition of organic matter and clay. Older soils have typically accumulated more organic residue and clay for binding particles; this has resulted in more pronounced structural development if it is assumed that the influence of the other soil forming factors has not varied.

The Hoh soils have weak structure, implying limited development, to a depth of about 21 inches. These soils do not have a cambic horizon, and they do not have any degree of structural development below a depth of about 21 inches.

The Calawah soils have moderate structure to a depth of 60 inches or more, which indicates that soil development has taken place over a relatively longer period of time. The texture is silt loam and silty clay loam, which also indicates a longer period of weathering than in the Hoh soils.

Parent Material

Parent material is the weathered and unweathered material from which soils form. Most soil differences caused by this factor are easily recognized. The soils in the survey area formed in a variety of parent material including (1) sedimentary rock, (2) basalt, (3) glacial till, (4) glacial outwash, (5) alluvium, (6) lacustrine and marine sediment, and (7) organic matter. The parent material of several soils throughout the survey area include additions of loess and volcanic ash. The parent material of lesser extent are old estuary deposits and landslide debris.

Hard, resistant sedimentary rock such as sandstone and conglomerate generally weather slowly to form less deep, skeletal soils. The Solleks and Terbies soils are typical of the soils that formed in these materials. Snahopish soils are more that 60 inches deep and formed in material weathered from hard sandstone and loess. The soils that formed in material weathered from the softer fine sandstone, siltstone, and basalt are more than 60 inches deep, are nonskeletal, and contain mostly soft rock fragments. Soils that formed in these materials are well drained soils of the Palix-Ilwaco general soil map unit and the Schnorbush soils that formed in material weathered from fine sandstone and siltstone. The very deep, well drained Louella, Makah, and Hyas soils formed in soft, easily weathered marine basalt.

Soils that formed in glacial till are underlain by very slowly permeable, very compact lodgment till in this area. This layer is quite uniform and severely restricts downward movement of water. Differences in thickness of the relatively loose, overlying ablation till are characteristic of certain soils. Depth to the restrictive layer is about 14 inches in the Catla soils; 20 to 40 inches in the Clallam, Elwha, Kydaka, McKenna, Sadie, and Zeeka soils; and more than 40 inches in the Ozette soils. The apparent trend of increasing depth of ablation till from east to west is probably a depositional feature. The increased depth of the Ozette soils is partially the result of loess deposition. This loess was deposited inland and became a significant component of the Calawah, Ilwaco, Ozette, Quillayute, Snahopish, and Zeeka soils.

Soils that formed in glacial outwash are typically very deep, do not have drainage restrictions, and are mostly coarse textured. The coarse fragments in these soils provides a greater proportion of large, rapidly drained voids that have limited surface area causing these soils to be droughty. This factor is less significant in high rainfall areas where soil moisture is replenished often. Outwash occurs as terraces and terrace escarpments. Hoypus and Neilton soils display typical outwash characteristics. They are coarse textured, very gravelly, excessively to somewhat excessively drained, and droughty. The sandy Dick soils are similar, but contain less than 15 percent coarse fragments and are not as droughty. Klone, Lyre, Solduc, and Wellman soils typically have a gravelly or very gravelly surface layer and a very gravelly subsoil over a coarse textured, well stratified substratum. The Solduc soils have some loess and volcanic ash in the surface layer and subsoil. These soils are well drained to somewhat excessively drained.

Alluvium has a broad range of characteristics. The soils that formed in this material are fine textured to coarse textured, are poorly drained to excessively drained, and can be recent or relatively old deposits.

Relatively recent alluvial soils are on low terraces and flood plains. Well drained Typic Xerofluvents, nearly level, Dungeness soils, and Hoh soils are examples of soils that display little evidence of soil development beneath the organically enriched surface layer. The addition of organic matter encourages the structural development of soils and darkens the surface layer. The substratum of these soils contains little visible evidence of alteration since deposition. Close observation of the varied substratum indicates textures ranging from fine silt loam to extremely gravelly coarse sand.

The poorly drained Bellingham, Lummi, Puget, and Tealwhit soils formed in medium- to fine-textured, stratified alluvium. The poor internal drainage of these soils is a function of slow permeability. Soil wetness restricts decomposition of organic material and encourages its accumulation within the soil profile. Organic matter coupled with a wetting and drying cycle in medium- to fine-textured material promotes structural development and segregation of soluble minerals within the soil. Mottling is a good indicator of restricted internal drainage. An example of soils that are poorly drained are the alluvial soils. Structure in the Bellingham, Puget, and Tealwhit soils can be observed to a depth of about 40 inches. Stratification in the Lummi soils is at a depth of about 9 inches.

The somewhat excessively drained Carlsborg and Sequim soils formed in coarse-textured stratified alluvium along the Dungeness River. The surface layer of these soils is very gravelly or gravelly sandy loam over loamy sand and sand that are extremely gravelly, very gravelly, or cobbly. The coarse-textured, rapidly permeable material is resistant to weathering. Soil structure is weak and is limited to the surface layer. These soils are droughty, and irrigation is necessary for maximum crop production.

The well drained Calawah and Queets soils formed in moderately fine-textured and medium-textured alluvium. The Calawah soils contain an admixture of loess over coarse-textured glacial outwash at a depth of 60 inches or more. The Calawah soils are in a higher position on the landscape and are much older than the Queets soils.

The glaciolacustrine sediment in the survey area is at higher elevations on inland positions representing the margin of the continental glacier. Deposits of this sediment are most commonly near upland stream

channels. This fine-textured sediment is parent material for the Casey soils.

The marine sediment in Clallam County, known as the Everson Glaciomarine Drift, became the parent material for the Agnew soils and contributed material for the Cassolary soils.

The undulating till plain in the area included many small shallow lakes. Aquatic vegetation has gradually filled these small water bodies with deposits of organic material. These organic deposits are deep and commonly contain a thin layer of volcanic ash. The very poorly drained Mukilteo soils, which are commonly ponded during wet periods, formed in this material.

Landslide debris is the parent material for Dystric Xerorthents, bouldery. The deposition of this extremely variable soil material consisting of landslide disrupted sandstone and conglomerate has caused the separation of Lake Crescent and Lake Sutherland.

Several soils in Clallam County contain admixtures of volcanic ash. The source of this thin deposit of ash has been correlated with an eruption of Mount Mazama. An intermittent layer of volcanic ash about 1 inch thick buried beneath about 18 inches of organic soil material has been identified at an archeological site near Sequim. The ash has significantly influenced the development of Clallam Variant gravelly loam.

Climate

The climatic factors active in soil formation are precipitation and temperature. In this survey area the influence of precipitation on soil formation processes is much more distinct than the influence of temperature. Most of the soils in this area are mesic.

Annual precipitation ranges from about 15 inches in the eastern part of the survey area to more than 140 inches in the west-central part. Moisture is involved in almost all of the physical, chemical, and biological processes in soils. The amount of moisture entering the soil influences weathering and translocation of minerals, transformations within the soil, and removal of minerals from the soil. Increased soil moisture content also reduces availability of oxygen and encourages accumulation rather than oxidation of organic matter.

A comparison of the Louella and Makah soils illustrates the influence of climate on soils that formed in similar parent materials. These parent materials are of similar age and in areas of similar slope. The parent rock of these soils is basalt of the Crescent Formation. The Louella soils receive an annual precipitation of 30 to 45 inches, while the Makah soils receive 90 to 140 inches. The higher precipitation on the Makah soils promotes greater production of plants, accumulation of more organic matter, and a thicker A horizon. The Louella soils have a dark colored surface layer about 11 inches thick compared to about 15 inches for the Makah soils.

The higher precipitation has been more effective in removing bases. The Makah soils are strongly acid to a depth of 60 inches or more, whereas the Louella soils are slightly acid in the surface layer and neutral at a depth of 60 inches. This relationship is also apparent in soils that formed in material derived from sandstone. The Solleks soils, which formed under high rainfall, are more acid than the Terbies soils. Throughout the survey area, reaction decreases as precipitation increases. It should be noted that the species of trees in a forest may also influence soil reaction.

Temperature, in addition to topsoil moisture content, influences the production, accumulation, and decomposition of organic matter. Generally, the amount of organic matter accumulated increases as temperature decreases because the rate of decomposition slows as temperature decreases. Soil moisture content influences the rate of oxidation and the population of soil organisms. Generally, the extremely wet conditions in this survey area promote accumulation of organic matter.

Soils below 1,800 feet elevation, such as the Makah soils, have a mesic temperature regime, whereas soils above about 1,600 feet elevation, such as the Hyas soils, are frigid. The remaining soil forming factors for these soils are comparable. The Makah soils have a dark-colored surface layer about 14 inches thick. The Hyas soils have a dark-colored surface layer about 17 inches thick. A greater accumulation of organic matter in the soil occurs at the higher elevation because the decomposition processes are slowed as a result of the cooler climate. A vegetation trend toward Pacific silver fir in addition to western hemlock on the Hyas soils may also enhance the accumulation of organic matter.

Living Organisms

The living organisms that affect soil formation are mainly vegetation, but soil micro-organisms also have a significant role. The influence of vegetation can be difficult to evaluate because of its dependence on climate; in this survey area, however, the existence of prairies in a predominantly forested area provides a unique opportunity for comparison.

The Sequim soils in this area have developed under a prairie ecosystem. The adjacent Carlsborg soils formed under an overstory of Douglas-fir and Pacific madrone. Other factors influencing these soils are similar, but there may be a slight difference in their age.

Prior to cultivation of the Sequim soils, the organic matter accumulation that formed their thick, dark-colored surface layer was derived mainly from grass and herbaceous cover, which contributed a very tough material resistant to decomposition (*18*). This organic accumulation developed a dark-colored surface layer as much as 23 inches thick. The original surface layer of the Carlsborg soils has been altered by cultivation to a depth of about 6 inches. The difference in the thickness

of the surface layer is attributed to the greater accumulation of resistant organic material in the Sequim soils. The Neilton soils are similar to the Carlsborg soils.

The Quillayute soils formed under prairie vegetation dominated by western brackenfern *Pteridium aquilinum pubescens* (*25*). It has a very dark brown and very dark grayish brown surface layer about 30 inches thick. The nearby Calawah soils formed under a forest cover dominated by western hemlock and have a dark brown surface layer about 15 inches thick. The difference in the thickness of the surface layer is attributed to differences in the plant cover and to the variable resistance to decomposition of organic material from different sources.

Topography

Topography refers to the initial shape and slope of the soil landscape and position. Lateral variation of soil properties with topography is caused by aspect, which affects microclimate and by steepness and shape of slope, which affect accumulation of water or runoff and erosion.

Variation in soils caused by differences in aspect is difficult to demonstrate conclusively in this survey area. Soil differences are recognizable, but their influence is largely overshadowed by high precipitation. During reforestation, aspect can have a critical effect on the survival of seedlings. Higher seedling losses occur on the warmer, drier, south- and southwest-facing slopes than on the cooler, moister north-facing slopes.

Soil differences as a result of position can be observed on the till plain of the Elwha-Clallam-Catla and the Ozette-Kydaka general soil map units.

The moderately well drained Catla, Clallam, and Elwha soils formed in nearly level to moderately sloping areas on a till plain. The very slowly permeable, very compact glacial till is at a depth of about 14 inches in the Catla soils, about 28 inches in the Clallam soils, and about 33 inches in the Elwha soils. The dense compact till restricts downward movement of water and promotes lateral flow. Closed depressional areas on the till plain collect both laterally moving subsurface water and surface runoff carrying sediment from the surrounding soils. This has resulted in the development of the poorly drained, mottled McKenna soils in depressional areas. Variations in other soil forming factors have contributed to the development of these soils, but topographic position is the dominant influence.

The very poorly drained Mukilteo soils, which are organic soils, are in basins on terraces. The influence of topography on these soils has been enhanced by the biotic factor. In this situation, depressional areas are ponded by internal and external flow, creating an environment conducive to the growth of wetland plants. Protected by water, plant remains have accumulated to form the deposits of organic material in which the Mukilteo soils formed.

A similar landscape pattern has developed in the Ozette-Kydaka general soil map unit. Both of the major soils in this unit are underlain by very slowly permeable, very compact glacial till. The poorly drained Kydaka soils are in depressional areas that collect runoff and subsurface flow from the surrounding moderately well drained Ozette soils.

The deep Terbies soils and the moderately deep Solleks soils formed in steep areas of hard sedimentary rock. The properties of these soils illustrate the effects of topography on the redistribution of parent material. Ridgetops in areas mapped as one of these soils have included areas of exposed sandstone or soils shallower to bedrock than is typical for the representative soil. This is caused by erosion and subsequent downslope movement of soil material from steep, somewhat exposed positions. The eroded material accumulates further downslope as colluvium.

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chiseling. Tillage to a depth of less than 16 inches with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter, in diameter. As a soil textural

class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

Coarse fragments. Mineral or rock particles larger than 2 millimeters in diameter.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—These soils have very high and high hydraulic conductivity and low water holding capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and low water holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.

Well drained.—These soils have intermediate water holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless artificial drainage is provided. Moderately well drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless artificial drainage is provided. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet

layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained.—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

Very poorly drained.—These soils are wet to the surface most of the time. They are wet enough to prevent the growth of important crops (except rice) unless artificially drained.

Drainage, surface. Runoff, or surface flow of water, from an area.

Duff. A term used to identify a generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature; for example, fire that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, and clay.

Firebreak. Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of men and equipment in fire fighting. Designated roads also serve as firebreaks.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial melt water. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of location and depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage. A rill is of lesser depth and can be smoothed over by ordinary tillage, and it normally is not in an area subject to concentrated runoff.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the number 2 precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color in hue of 10YR, value of 6, and chroma of 4.

Narrow-base terrace. A terrace no more than 4 to 8 feet wide at the base. A narrow-base terrace is similar to a broad-base terrace, except for the width of the ridge and channel.

Natural reforestation. Seedlings that become established from seed disseminated by nearby cone-bearing trees. The expected period of time it takes for an area to naturally reforest is described by the terms *readily*, seedlings adequately occupy the area in 2 to 5 years, and *periodically*, 5 to 10 years.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0 06 inch
Slow	0 06 to 0 2 inch
Moderately slow	0 2 to 0 6 inch
Moderate	0 6 inch to 2 0 inches
Moderately rapid	2 0 to 6 0 inches
Rapid	6 0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4 5
Very strongly acid	4 5 to 5 0
Strongly acid	5 1 to 5 5
Medium acid	5 6 to 6 0
Slightly acid	6.1 to 6 5
Neutral	6 6 to 7 3
Mildly alkaline	7 4 to 7 8
Moderately alkaline	7 9 to 8 4
Strongly alkaline	8 5 to 9 0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the

soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0 002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site curve (50-year). A set of related curves on a graph that shows the average height of dominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant trees that are 50 years old or are 50 years old at breast height.

Site curve (100-year). A set of related curves on a graph that show the average height of dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant and codominant trees that are 100 years old or are 100 years old at breast height.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skid trail. The path left by skidded logs and by the equipment used to pull them.

Skidding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most skidding systems involve pulling the trees with wire cables attached to a bulldozer or rubber-tired tractor. To reduce friction and soil disturbance, felled trees generally are pulled with one end lifted.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2 0 to 1 0
Coarse sand	1 0 to 0.5
Medium sand	0 5 to 0 25
Fine sand	0 25 to 0 10
Very fine sand	0 10 to 0 05
Silt	0 05 to 0 002
Clay	less than 0 002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 6 to 15 inches (15 to 38 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below a depth of 16 inches, ordinarily to shatter a hardpan or claypan

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and

are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The action of uprooting and tipping over trees by the wind.

Yarding path. The path left by cable-yarded logs as they are pulled uphill or downhill to a nearby, central area.

Yield (woodland). The volume of wood fiber from trees harvested from a certain area. Yield commonly is measured in board feet or cubic feet per acre.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.1 inch or more	Average snowfall
	Recorded in the period 1951-78 at Port Angeles, Wash.										
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	44.9	33.4	39.2	57	17	72	4.57	2.41	6.33	12	2.1
February---	48.0	35.6	41.8	60	24	88	2.68	1.40	3.73	8	1.1
March------	50.0	36.0	43.0	61	25	116	2.17	1.21	2.95	8	1.1
April------	55.0	39.3	47.2	69	30	216	1.28	0.56	1.86	5	0.0
May--------	60.7	44.0	52.3	79	34	381	0.90	0.42	1.27	4	0.0
June-------	64.8	48.3	56.6	82	40	498	0.83	0.33	1.23	3	0.0
July-------	68.7	50.8	59.8	87	43	614	0.50	0.13	0.79	2	0.0
August-----	68.4	51.0	59.7	86	42	611	0.89	0.19	1.44	3	0.0
September--	65.9	48.3	57.1	81	38	513	1.21	0.39	1.84	4	0.0
October----	57.9	43.0	50.5	70	32	326	2.50	1.06	3.66	8	0.0
November---	50.1	37.6	43.9	62	24	139	3.74	1.99	5.17	10	0.4
December---	46.2	35.1	40.7	58	19	87	4.05	2.86	5.14	12	1.2
Yearly:											
Average--	56.7	41.9	49.3	---	---	---	---	---	---	---	---
Extreme--	---	---	---	90	14	---	---	---	---	---	---
Total	---	---	---	---	---	3,661	25.32	21.27	29.20	79	5.9

See footnote at end of table.

TABLE 1.--TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature: Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have--: Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days[1]	Precipitation: Average	2 years in 10 will have--: Less than--	More than--	Average number of days with 0.1 inch or more	Average snowfall
Recorded in the period 1951-78 at Forks, Wash.											
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	44.9	33.2	39.0	57	15	81	18.75	12.08	24.80	20	5.9
February---	49.0	34.6	41.8	63	22	103	13.81	8.90	18.25	17	1.7
March------	50.5	33.9	42.2	69	20	107	12.98	8.64	16.94	18	4.0
April------	55.8	36.6	46.2	76	27	194	7.88	4.27	10.83	14	0.1
May--------	62.1	41.1	51.6	86	30	360	4.85	2.39	6.86	11	0.0
June-------	66.3	46.1	56.2	88	35	486	3.10	1.27	4.58	8	0.0
July-------	71.4	48.7	60.1	94	38	623	2.19	0.43	3.54	5	0.0
August-----	71.7	49.1	60.4	94	39	632	2.88	0.89	4.45	7	0.0
September--	69.4	46.4	58.0	90	33	540	5.31	2.17	7.85	8	0.0
October----	60.9	41.8	51.4	80	28	353	11.72	5.89	16.47	15	0.0
November---	51.2	36.6	44.0	65	23	137	15.79	9.45	21.46	18	0.4
December---	46.1	34.6	40.4	58	18	96	19.22	14.23	23.85	21	3.3
Yearly:											
Average--	58.3	40.2	49.3	---	---	---	---	---	---	---	---
Extreme--	---	---	---	97	12	---	---	---	---	---	---
Total	---	---	---	---	---	3,712	118.48	2.91	33.50	162	15.4

See footnote at end of table.

TABLE 1.--TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.1 inch or more	Average snowfall
Recorded in the period 1951-78 at Sequim, Wash.											
	°F	°F	°F	°F	°F	Units	In	In	In		In
January---	44.7	32.5	38.6	58	15	64	2.45	1.35	3.34	8	3.5
February--	48.9	34.5	41.8	61	22	91	1.35	0.64	1.91	5	0.6
March-----	51.3	35.0	43.2	62	23	127	1.30	0.75	1.75	5	0.9
April-----	56.2	38.7	47.5	69	29	225	1.06	0.45	1.54	4	0.0
May-------	62.5	43.6	53.1	80	33	406	0.94	0.48	1.31	3	0.0
June------	67.2	48.3	57.8	85	39	534	0.97	0.40	1.41	4	0.0
July------	71.8	50.9	61.4	90	43	663	0.47	0.10	0.76	1	0.0
August----	71.7	51.3	61.5	89	43	667	0.81	0.17	1.31	3	0.0
September-	68.1	48.4	58.3	84	39	549	0.97	0.30	1.49	3	0.0
October---	59.2	42.4	50.8	72	31	335	1.39	0.63	2.01	5	0.0
November--	50.4	36.5	43.5	64	23	138	2.12	1.11	2.95	7	0.1
December--	45.9	34.0	40.0	59	17	85	2.37	1.63	3.04	9	2.7
Yearly.											
Average-	58.2	41.3	49.8	---	---	---	---	---	---	---	---
Extreme-	---	---	---	92	11	---	---	---	---	---	---
Total---	---	---	---	---	---	3,884	16.20	14.00	18.32	57	7.8

[1]A growing degree day is an index of the amount of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Recorded in the period 1951-78 at Port Angeles, Wash.			
Last freezing temperature in spring:			
1 year in 10 later than--	February 28	April 6	April 29
2 years in 10 later than--	February 16	March 23	April 22
5 years in 10 later than--	January 19	February 23	April 8
First freezing temperature in fall:			
1 year in 10 earlier than--	November 25	November 4	October 19
2 years in 10 earlier than--	December 9	November 15	October 26
5 years in 10 earlier than--	January 11	December 7	November 9
Recorded in the period 1951-78 at Forks, Wash.			
Last freezing temperature in spring:			
1 year in 10 later than--	March 31	April 28	May 30
2 years in 10 later than--	March 17	April 19	May 24
5 years in 10 later than--	February 19	April 1	May 11
First freezing temperature in fall:			
1 year in 10 earlier than--	November 6	October 21	September 30
2 years in 10 earlier than--	November 20	October 30	October 7
5 years in 10 earlier than--	December 16	November 17	October 20

TABLE 2.--FREEZE DATES IN SPRING AND FALL--Continued

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Recorded in the period 1951-78 at Sequim, Wash.			
Last freezing temperature in spring.			
1 year in 10 later than--	March 24	April 21	May 5
2 years in 10 later than--	March 8	April 7	April 29
5 years in 10 later than--	February 4	March 10	April 17
First freezing temperature in fall:			
1 year in 10 earlier than--	November 15	November 2	October 15
2 years in 10 earlier than--	November 27	November 11	October 21
5 years in 10 earlier than--	December 22	November 29	November 3

TABLE 3.--GROWING SEASON

Probability	Length of growing season if daily minimum temperature exceeds-- 24° F	28° F	32° F
Recorded in the period 1951-78 at Port Angeles, Wash.			
	Days	Days	Days
9 years in 10	285	244	182
8 years in 10	308	258	193
5 years in 10	365	286	215
2 years in 10	365	322	237
1 year in 10	365	365	248
Recorded in the period 1951-78 at Forks, Wash.			
	Days	Days	Days
9 years in 10	249	189	130
8 years in 10	267	203	141
5 years in 10	301	229	161
2 years in 10	340	255	181
1 year in 10	365	269	192
Recorded in the period 1951-78 at Sequim, Wash.			
	Days	Days	Days
9 years in 10	270	216	172
8 years in 10	288	231	181
5 years in 10	337	261	200
2 years in 10	365	292	218
1 year in 10	365	311	227

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Agnew silt loam, 0 to 8 percent slopes	2,506	0.4
2	Andeptic Udorthents, very steep	5,466	0.9
3	Beaches	2,195	0.4
4	Bellingham silty clay loam	3,484	0.6
5	Calawah silt loam, 0 to 15 percent slopes	5,857	0.9
6	Carlsborg gravelly sandy loam, 0 to 5 percent slopes	3,820	0.6
7	Carlsborg-Dungeness complex, 0 to 5 percent slopes	2,988	0.5
8	Casey silty clay loam, 0 to 10 percent slopes	1,950	0.3
9	Cassolary fine sandy loam, 0 to 8 percent slopes	2,765	0.4
10	Catla gravelly sandy loam, 2 to 15 percent slopes	6,695	1.1
11	Catla-Hoypus complex, 2 to 65 percent slopes	1,669	0.3
12	Clallam gravelly sandy loam, 0 to 15 percent slopes	19,346	3.1
13	Clallam gravelly sandy loam, 15 to 30 percent slopes	2,207	0.4
14	Clallam-Hoypus gravelly sandy loams, 0 to 15 percent slopes	1,988	0.3
15	Clallam Variant gravelly loam, 10 to 30 percent slopes	1,394	0.2
16	Dick loamy sand, 0 to 15 percent slopes	2,712	0.4
17	Dungeness silt loam	2,549	0.4
18	Dystric Xerorthents, bouldery	1,409	0.2
19	Dystric Xerorthents, extremely steep	756	0.1
20	Elwha gravelly sandy loam, 0 to 15 percent slopes	28,578	4.6
21	Elwha gravelly sandy loam, 15 to 35 percent slopes	15,332	2.5
22	Hoh silt loam	1,361	0.2
23	Hoypus gravelly sandy loam, 0 to 15 percent slopes	7,157	1.2
24	Hoypus gravelly sandy loam, 15 to 30 percent slopes	2,297	0.4
25	Hoypus gravelly loamy sand, 30 to 65 percent slopes	1,754	0.3
26	Hyas gravelly loam, 50 to 80 percent slopes	4,219	0.7
27	Ilwaco silt loam, 15 to 35 percent slopes	16,669	2.7
28	Ilwaco-Klone complex, 30 to 65 percent slopes	2,234	0.4
29	Klone very gravelly loam, 0 to 15 percent slopes	1,566	0.3
30	Klone very gravelly loam, 30 to 65 percent slopes	4,139	0.7
31	Klone-Ozette-Tealwhit complex, 0 to 15 percent slopes	16,222	2.6
32	Kydaka silty clay loam	2,886	0.5
33	Kydaka-Zeeka complex, 0 to 20 percent slopes	17,549	2.8
34	Louella gravelly loam, 10 to 30 percent slopes	3,564	0.6
35	Louella gravelly loam, 30 to 65 percent slopes	14,245	2.3
36	Louella gravelly loam, 65 to 90 percent slopes	3,743	0.6
37	Louella Variant very gravelly loam, 2 to 15 percent slopes	273	*
38	Lummi silt loam	1,366	0.2
39	Lyre very gravelly sandy loam, 0 to 15 percent slopes	3,609	0.6
40	Lyre very gravelly sandy loam, 15 to 30 percent slopes	545	0.1
41	Makah gravelly loam, 50 to 80 percent slopes	16,224	2.6
42	McKenna gravelly silt loam	1,974	0.3
43	Mukilteo muck	1,446	0.2
44	Neilton very gravelly loamy sand, 30 to 70 percent slopes	7,950	1.3
45	Neilton very gravelly sandy loam, 5 to 30 percent slopes	1,791	0.3
46	Neilton very cobbly sandy loam, 0 to 5 percent slopes	5,377	0.9
47	Ozette silt loam, 5 to 35 percent slopes	102,520	16.6
48	Ozette-Andeptic Udorthents complex, 5 to 80 percent slopes	20,237	3.3
49	Palix loam, 30 to 65 percent slopes	39,871	6.5
50	Palix loam, 65 to 90 percent slopes	9,793	1.6
51	Palix loam, cool, 65 to 90 percent slopes	2,416	0.4
52	Pits	510	0.1
53	Puget silt loam	3,815	0.6
54	Queets silt loam	16,406	2.7
55	Queets-Tealwhit silt loams, 0 to 5 percent slopes	2,336	0.4
56	Quillayute silt loam, 0 to 8 percent slopes	3,973	0.6
57	Riverwash	343	0.1
58	Sadie gravelly loam, 0 to 35 percent slopes	9,586	1.6
59	Schnorbush loam, 0 to 20 percent slopes	3,728	0.6
60	Schnorbush loam, 20 to 55 percent slopes	3,320	0.5
61	Schnorbush loam, cool, 40 to 80 percent slopes	278	*
62	Schnorbush-Casey complex, 0 to 20 percent slopes	5,096	0.8
63	Sequim very gravelly sandy loam	2,214	0.4
64	Sequim-McKenna-Mukilteo complex	747	0.1
65	Snahopish very gravelly loam, 35 to 70 percent slopes	40,986	6.6
66	Solduc very gravelly sandy loam	25,213	4.1
67	Solleks very gravelly loam, 60 to 90 percent slopes	17,527	2.8
68	Solleks very gravelly loam, cool, 60 to 90 percent slopes	4,297	0.7
69	Tealwhit silt loam, 0 to 5 percent slopes	12,021	1.9
70	Terbies very gravelly sandy loam, 30 to 65 percent slopes	16,934	2.7

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
71	Terbies very gravelly sandy loam, 65 to 85 percent slopes	4,058	0.7
72	Terbies-Rock outcrop complex, 65 to 85 percent slopes	2,291	0.4
73	Typic Xerofluvents, nearly level	1,396	0.2
74	Wellman gravelly silt loam	338	0.1
75	Yeary gravelly loam, 0 to 15 percent slopes	3,040	0.5
76	Yeary gravelly loam, 15 to 35 percent slopes	2,874	0.5
77	Zeeka silt loam, 5 to 25 percent slopes	2,422	0.4
	Water	1,268	0.2
	Total	617,680	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. Only the soils suited to crops and pasture are listed]

Soil name and map symbol	Pasture		Grass-legume hay		Grass hay		Barley		Strawberries		Raspberries	
	N	I	N	I	N	I	N	I	N	I	N	I
	AUM*	AUM*	Ton	Ton	Ton	Ton	Bu	Bu	Crate	Crate	Ton	Ton
1----- Agnew	8	18	3	8	3	8	30	40	---	---	---	4
4----- Bellingham	6	---	---	---	6	---	---	---	---	---	---	---
6----- Carlsborg	3	10	2	6	2	6	---	---	---	220	---	3
7----- Carlsborg-Dungeness	7	14	3	7	2	8	---	---	---	245	---	4
8----- Casey	12	---	---	---	4	---	---	---	---	---	---	---
9----- Cassolary	6	18	3	8	---	---	---	60	---	250	---	4
10----- Catla	---	---	2	---	---	---	---	---	---	---	---	---
12----- Clallam	6	12	2	5	2	5	---	---	---	220	---	3
16----- Dick	5	18	3	8	3	8	30	60	---	230	---	4
17----- Dungeness	12	20	5	10	5	10	40	80	---	280	---	4
22----- Hoh	12	---	5	---	---	---	---	---	---	---	---	---
38----- Lummi	8	14	---	---	5	10	---	---	---	---	---	---
42----- McKenna	8	---	---	---	---	---	---	---	---	---	---	---
45----- Neilton	4	---	1.5	---	1.5	---	---	---	---	---	---	---
46----- Neilton	4	---	1.5	---	---	---	---	---	---	---	---	---
53----- Puget	10	14	5	8	5	8	40	100	---	---	---	---
54----- Queets	12	---	5	---	5	---	---	---	---	---	---	---
55----- Queets-Tealwhit	12	---	5	---	5	---	---	---	---	---	---	---
56----- Quillayute	9	15	5	8	5	8	---	---	---	---	---	---
62----- Schnorbush-Casey	10	---	4	4	---	---	---	---	---	---	---	---
63----- Sequim	3	18	2	7	2	8	---	---	---	220	---	3.5

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Pasture		Grass-legume hay		Grass hay		Barley		Strawberries		Raspberries	
	N	I	N	I	N	I	N	I	N	I	N	I
	AUM*	AUM*	Ton	Ton	Ton	Ton	Bu	Bu	Crate	Crate	Ton	Ton
64 Sequim-McKenna-Mukilteo	3	10	2	8	2	8	---	---	---	---	---	---
74 Wellman	10	15	5	8	5	8	---	---	---	---	---	---
75, 76 Yeary	6	12	3	7	2	5	---	---	---	---	---	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Trees to plant
1------------------- Agnew	9W	Moderate	Moderate	Moderate	Moderate	Douglas-fir--------- Red alder----------- Western redcedar---- Western hemlock----- Bigleaf maple--------	95 --- --- --- ---	Douglas-fir, red alder.
2------------------- Andeptic Udorthents	15R	Severe	Slight	Slight	Moderate	Western hemlock----- Sitka spruce-------- Western redcedar----	105 --- ---	Western hemlock, Sitka spruce.
4------------------- Bellingham	6W	Severe	Moderate	Moderate	Severe	Red alder----------- Bigleaf maple------- Western redcedar---- Western hemlock-----	85 --- --- ---	Western redcedar, red alder.
5------------------- Calawah	17A	Moderate	Slight	Slight	Moderate	Western hemlock----- Western redcedar---- Sitka spruce-------- Red alder----------- Douglas-fir---------	111 --- --- --- ---	Western hemlock, Douglas-fir, Sitka spruce.
6------------------- Carlsborg	5F	Slight	Severe	Slight	Moderate	Douglas-fir--------- Pacific madrone-----	75 ---	Douglas-fir.
7*:								
Carlsborg----------	5F	Slight	Severe	Slight	Moderate	Douglas-fir--------- Pacific madrone-----	75 ---	Douglas-fir.
Dungeness----------	11A	Moderate	Slight	Slight	Moderate	Douglas-fir--------- Red alder-----------	115 ---	Douglas-fir.
8------------------- Casey	8W	Moderate	Slight	Moderate	Moderate	Douglas-fir--------- Red alder----------- Western redcedar---- Western hemlock----- Red alder-----------	94 --- --- --- ---	Douglas-fir, western hemlock.
9------------------- Cassolary	11S	Moderate	Moderate	Slight	Moderate	Douglas-fir--------- Western redcedar---- Western hemlock-----	110 --- ---	Douglas-fir.
10------------------ Catla	6D	Moderate	Severe	Severe	Severe	Douglas-fir--------- Western hemlock----- Western redcedar---- Grand fir----------- Pacific madrone----- Red alder-----------	82 --- --- --- --- ---	Douglas-fir, red alder.
11*:								
Catla--------------	6D	Moderate	Severe	Severe	Severe	Douglas-fir--------- Western hemlock----- Western redcedar---- Grand fir----------- Pacific madrone----- Red alder-----------	82 --- --- --- --- ---	Douglas-fir, red alder.
Hoypus-------------	10R	Severe	Severe	Slight	Moderate	Douglas-fir--------- Western hemlock----- Western redcedar---- Bigleaf maple------- Pacific madrone-----	101 --- --- --- ---	Douglas-fir.

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
12, 13------------- Clallam	9D	Slight	Severe	Moderate	Moderate	Douglas-fir--------- Western hemlock----- Grand fir----------- Western redcedar---- Red alder----------- Pacific madrone-----	98 --- --- --- --- ---	Douglas-fir.
14*: Clallam-----------	9D	Slight	Severe	Moderate	Moderate	Douglas-fir--------- Western hemlock----- Grand fir----------- Western redcedar---- Red alder----------- Pacific madrone-----	98 --- --- --- --- ---	Douglas-fir.
Hoypus------------	10F	Slight	Severe	Slight	Moderate	Douglas-fir--------- Western hemlock----- Western redcedar---- Bigleaf maple------- Pacific madrone-----	101 --- --- --- ---	Douglas-fir.
15----------------- Clallam Variant	10D	Moderate	Slight	Moderate	Moderate	Douglas-fir--------- Western hemlock----- Western redcedar---- Red alder-----------	103 --- --- ---	Douglas-fir.
16----------------- Dick	10S	Moderate	Moderate	Slight	Moderate	Douglas-fir--------- Western hemlock----- Western redcedar---- Grand fir----------- Red alder-----------	110 --- --- --- ---	Douglas-fir.
17----------------- Dungeness	11A	Moderate	Slight	Slight	Moderate	Douglas-fir--------- Red alder-----------	115 ---	Douglas-fir.
18----------------- Dystric Xerorthents	7R	Severe	Severe	Slight	Moderate	Douglas-fir--------- Western hemlock----- Western redcedar----	90 --- ---	Douglas-fir.
19----------------- Dystric Xerorthents	6R	Severe	Moderate	Slight	Moderate	Douglas-fir--------- Western redcedar---- Western hemlock-----	85 --- ---	Douglas-fir.
20, 21------------- Elwha	11D	Slight	Moderate	Moderate	Moderate	Douglas-fir--------- Red alder----------- Western hemlock----- Grand fir----------- Western redcedar---- Bigleaf maple-------	111 --- --- --- --- ---	Douglas-fir.
22----------------- Hoh	18A	Moderate	Slight	Slight	Moderate	Red alder----------- Sitka spruce-------- Bigleaf maple-------	110 --- ---	Red alder, Sitka spruce.
23, 24------------- Hoypus	10F	Slight	Severe	Slight	Moderate	Douglas-fir--------- Western hemlock----- Western redcedar---- Bigleaf maple------- Pacific madrone-----	101 --- --- --- ---	Douglas-fir.
25----------------- Hoypus	10R	Severe	Severe	Slight	Moderate	Douglas-fir--------- Western hemlock----- Western redcedar---- Bigleaf maple------- Pacific madrone-----	101 --- --- --- ---	Douglas-fir.

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	
26 Hyas	14R	Severe	Slight	Slight	Moderate	Western hemlock Pacific silver fir Sitka spruce Western redcedar	82 --- --- ---	Western hemlock, Pacific silver fir.
27 Ilwaco	17A	Moderate	Slight	Slight	Severe	Western hemlock Red alder Western redcedar	110 --- ---	Western hemlock.
28*:								
Ilwaco	17R	Severe	Slight	Slight	Severe	Western hemlock Red alder Western redcedar	110 --- ---	Western hemlock.
Klone	16R	Severe	Slight	Slight	Slight	Western hemlock Sitka spruce Western redcedar	104 --- ---	Western hemlock, Douglas-fir.
29 Klone	17A	Moderate	Slight	Slight	Slight	Western hemlock Sitka spruce Western redcedar	112 --- ---	Western hemlock, Douglas-fir.
30 Klone	16R	Severe	Slight	Slight	Slight	Western hemlock Sitka spruce Western redcedar	104 --- ---	Western hemlock, Douglas-fir.
31*:								
Klone	17A	Moderate	Slight	Slight	Slight	Western hemlock Sitka spruce Western redcedar	112 --- ---	Western hemlock, Douglas-fir.
Ozette	18D	Moderate	Slight	Moderate	Moderate	Western hemlock Western redcedar Sitka spruce Red alder	113 --- --- ---	Western hemlock.
Tealwhit	7W	Severe	Moderate	Severe	Moderate	Red alder Western redcedar Western hemlock Sitka spruce	90 --- --- ---	Western hemlock, Sitka spruce, western redcedar, red alder.
32 Kydaka	11W	Severe	Moderate	Severe	Moderate	Western redcedar Lodgepole pine	70 ---	Western redcedar.
33*:								
Kydaka	11W	Severe	Moderate	Severe	Moderate	Western redcedar Lodgepole pine	70 ---	Western redcedar.
Zeeka	13D	Moderate	Slight	Moderate	Moderate	Western hemlock Western redcedar Pacific silver fir	90 --- ---	Western hemlock.
34 Louella	8A	Moderate	Moderate	Slight	Moderate	Douglas-fir Grand fir Western hemlock Western redcedar Bigleaf maple	93 --- --- --- ---	Douglas-fir.
35 Louella	8R	Severe	Moderate	Slight	Moderate	Douglas-fir Grand fir Western hemlock Western redcedar Bigleaf maple	93 --- --- --- ---	Douglas-fir.

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
36------------------ Louella	7R	Severe	Moderate	Slight	Moderate	Douglas-fir--------- Grand fir----------- Western hemlock----- Western redcedar---- Bigleaf maple-------	80 --- --- --- ---	Douglas-fir.
37------------------ Louella Variant	12F	Moderate	Severe	Slight	Moderate	Douglas-fir--------- Western redcedar---- Grand fir----------- Western hemlock----- Red alder----------- Bigleaf maple-------	126 --- --- --- --- ---	Douglas-fir.
38------------------ Lummi	7W	Severe	Moderate	Severe	Severe	Red alder----------- Western redcedar---- Western hemlock----- Black cottonwood---- Willow--------------	90 --- --- --- ---	Western redcedar, red alder.
39, 40-------------- Lyre	11F	Slight	Moderate	Slight	Moderate	Douglas-fir--------- Western hemlock-----	119 ---	Douglas-fir, western hemlock.
41------------------ Makah	11R	Severe	Slight	Slight	Severe	Western hemlock----- Sitka spruce-------- Pacific silver fir-- Western redcedar----	96 --- --- ---	Western hemlock, Douglas-fir.
42------------------ McKenna	7W	Severe	Severe	Severe	Severe	Red alder----------- Western redcedar---- Western hemlock-----	90 --- ---	Western redcedar, red alder.
43------------------ Mukilteo	7W	Severe	Severe	Severe	Severe	Red alder----------- Western redcedar---- Western hemlock-----	87 --- ---	Western redcedar, red alder.
44------------------ Neilton	10R	Severe	Severe	Slight	Moderate	Douglas-fir--------- Grand fir----------- Western hemlock----- Western redcedar----	105 --- --- ---	Douglas-fir.
45------------------ Neilton	10F	Slight	Severe	Slight	Moderate	Douglas-fir--------- Grand fir----------- Western hemlock----- Western redcedar----	105 --- --- ---	Douglas-fir.
46------------------ Neilton	6F	Slight	Severe	Slight	Moderate	Douglas-fir--------- Grand fir----------- Western hemlock----- Western redcedar----	79 --- --- ---	Douglas-fir.
47------------------ Ozette	18D	Moderate	Slight	Moderate	Moderate	Western hemlock----- Western redcedar---- Sitka spruce-------- Red alder-----------	113 --- --- ---	Western hemlock.
48*:								
Ozette--------------	18D	Moderate	Slight	Moderate	Moderate	Western hemlock----- Western redcedar---- Sitka spruce-------- Red alder-----------	113 --- --- ---	Western hemlock.
Andeptic Udorthents--------	15R	Severe	Slight	Slight	Moderate	Western hemlock----- Sitka spruce-------- Western redcedar----	105 --- ---	Western hemlock, Sitka spruce.

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
49, 50 Palix	18R	Severe	Slight	Slight	Moderate	Western hemlock Douglas-fir Sitka spruce Western redcedar	112 --- --- ---	Douglas-fir, western hemlock.
51 Palix	16R	Severe	Slight	Slight	Moderate	Western hemlock Sitka spruce Western redcedar Red alder Pacific silver fir	105 --- --- --- ---	Douglas-fir, Sitka spruce, western hemlock.
53 Puget	7W	Moderate	Slight	Severe	Severe	Red alder Black cottonwood Western redcedar Willow	90 --- --- ---	Western redcedar, red alder.
54 Queets	18A	Moderate	Slight	Slight	Moderate	Western hemlock Red alder Sitka spruce	114 100 ---	Western hemlock, Sitka spruce, red alder.
55*:								
Queets	18A	Moderate	Slight	Slight	Moderate	Western hemlock Red alder Sitka spruce	114 100 ---	Western hemlock, Sitka spruce, red alder.
Tealwhit	7W	Severe	Moderate	Severe	Moderate	Red alder Western redcedar Western hemlock Sitka spruce	90 --- --- ---	Western hemlock, Sitka spruce, western redcedar, red alder.
56 Quillayute	18A	Moderate	Slight	Slight	Moderate	Western hemlock Sitka spruce Red alder	114 --- ---	Western hemlock, Sitka spruce.
58 Sadie	18D	Moderate	Slight	Moderate	Moderate	Douglas-fir Western hemlock Sitka spruce Western redcedar Grand fir Red alder	118 112 --- --- --- ---	Douglas-fir, western hemlock.
59 Schnorbush	12A	Moderate	Slight	Slight	Moderate	Douglas-fir Grand fir Western hemlock Western redcedar Red alder Bigleaf maple	117 --- --- --- --- ---	Douglas-fir.
60 Schnorbush	12R	Severe	Slight	Slight	Moderate	Douglas-fir Grand fir Western hemlock Western redcedar Red alder Bigleaf maple	117 --- --- --- --- ---	Douglas-fir.
61 Schnorbush	11R	Severe	Slight	Slight	Moderate	Douglas-fir Grand fir Western hemlock Western redcedar Red alder	105 --- --- --- ---	Douglas-fir.

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
62*:								
Schnorbush	12A	Moderate	Slight	Slight	Moderate	Douglas-fir Grand fir Western hemlock Western redcedar Red alder Bigleaf maple	117 --- --- --- --- ---	Douglas-fir.
Casey	8W	Moderate	Slight	Moderate	Moderate	Douglas-fir Bigleaf maple Western redcedar Western hemlock Red alder	94 --- --- --- ---	Douglas-fir, western hemlock.
63 Sequim	6F	Slight	Severe	Slight	Moderate	Douglas-fir	75	Douglas-fir.
64*:								
Sequim	6F	Slight	Severe	Slight	Moderate	Douglas-fir	75	Douglas-fir.
McKenna	7W	Severe	Severe	Severe	Severe	Red alder Western redcedar Western hemlock	90 --- ---	Western redcedar, red alder.
Mukilteo	7W	Severe	Severe	Severe	Severe	Red alder Western redcedar Western hemlock	87 --- ---	Western redcedar, red alder.
65 Snahopish	16R	Severe	Moderate	Slight	Moderate	Western hemlock Sitka spruce Pacific silver fir	102 --- ---	Western hemlock, Douglas-fir.
66 Solduc	16F	Slight	Moderate	Slight	Moderate	Western hemlock Douglas-fir Sitka spruce	103 111 ---	Western hemlock, Douglas-fir.
67 Solleks	13R	Severe	Moderate	Moderate	Moderate	Western hemlock Sitka spruce Pacific silver fir	90 --- ---	Western hemlock, Douglas-fir.
68 Solleks	12R	Severe	Moderate	Moderate	Moderate	Western hemlock Pacific silver fir Sitka spruce	85 --- ---	Western hemlock, Pacific silver fir.
69 Tealwhit	7W	Severe	Moderate	Severe	Moderate	Red alder Western redcedar Western hemlock Sitka spruce	90 --- --- ---	Western hemlock, Sitka spruce, western redcedar, red alder.
70, 71 Terbies	8R	Severe	Moderate	Slight	Moderate	Douglas-fir Western hemlock Grand fir Western redcedar Bigleaf maple	93 --- --- --- ---	Douglas-fir.
72*:								
Terbies	8R	Severe	Moderate	Slight	Moderate	Douglas-fir Western hemlock Grand fir Western redcedar Bigleaf maple	93 --- --- --- ---	Douglas-fir.
Rock outcrop.								

See footnote at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns				Potential productivity		Trees to plant
		Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Common trees	Site index	
73------------------ Typic Xerofluvents	8W	Moderate	Moderate	Slight	Moderate	Red alder----------- Grand fir----------- Douglas-fir----------	98 --- ---	Douglas-fir, red alder.
74------------------ Wellman	17A	Slight	Slight	Slight	Moderate	Western hemlock----- Western redcedar---- Sitka spruce--------	115 --- ---	Western hemlock, Sitka spruce.
75, 76-------------- Yeary	9D	Moderate	Moderate	Moderate	Moderate	Douglas-fir--------- Grand fir----------- Western redcedar---- Western hemlock----- Pacific madrone----- Bigleaf maple-------	98 --- --- --- --- ---	Douglas-fir.
77------------------ Zeeka	13D	Moderate	Slight	Moderate	Moderate	Western hemlock----- Western redcedar---- Pacific silver fir--	90 --- ---	Western hemlock.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
1 Agnew	Moderate: wetness, dusty.	Moderate: wetness, dusty.	Moderate: slope, wetness, dusty.	Severe: erodes easily.
2 Andeptic Udorthents	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
3*. Beaches				
4 Bellingham	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
5 Calawah	Slight	Slight	Severe: slope.	Slight.
6 Carlsborg	Severe: flooding.	Moderate: small stones.	Severe: small stones.	Slight.
7*:				
Carlsborg	Severe: flooding.	Moderate: small stones.	Severe: small stones.	Slight.
Dungeness	Severe: flooding.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.
8 Casey	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, small stones, wetness.	Slight.
9 Cassolary	Slight	Slight	Moderate: slope.	Slight.
10 Catla	Severe: wetness, cemented pan.	Severe: wetness, cemented pan.	Severe: slope, small stones, wetness.	Severe: wetness.
11*:				
Catla	Severe: wetness, cemented pan.	Severe: wetness, cemented pan.	Severe: slope, small stones, wetness.	Severe: wetness.
Hoypus	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
12 Clallam	Moderate: small stones, wetness.	Moderate: wetness, small stones.	Severe: slope, small stones.	Moderate: wetness.
13 Clallam	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: wetness, slope.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
14*:				
Clallam	Moderate: small stones, wetness.	Moderate: wetness, small stones.	Severe: slope, small stones.	Moderate: wetness.
Hoypus	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Slight.
15 Clallam Variant	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.
16 Dick	Slight	Slight	Severe: slope.	Slight.
17 Dungeness	Severe: flooding.	Moderate: dusty.	Moderate: dusty.	Severe: erodes easily.
18 Dystric Xerorthents	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: large stones, slope, small stones.
19 Dystric Xerorthents	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
20 Elwha	Moderate: small stones, wetness.	Moderate: wetness, small stones.	Severe: slope, small stones.	Moderate: wetness.
21 Elwha	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
22 Hoh	Severe: flooding.	Slight	Moderate: small stones, flooding.	Severe: erodes easily.
23 Hoypus	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Slight.
24 Hoypus	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.
25 Hoypus	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
26 Hyas	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
27 Ilwaco	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
28*:				
Ilwaco	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Klone	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
29: Klone	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
30: Klone	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
31*:				
Klone	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
Ozette	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Tealwhit	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.
32: Kydaka	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
33*:				
Kydaka	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Zeeka	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Moderate: wetness.
34: Louella	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.
35, 36: Louella	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
37: Louella Variant	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight.
38: Lummi	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.
39: Lyre	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
40: Lyre	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.
41: Makah	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
42: McKenna	Severe: ponding.	Severe: ponding.	Severe: small stones, ponding.	Severe: ponding.
43: Mukilteo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
44: Neilton	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.
45: Neilton	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Moderate: slope.
46: Neilton	Severe: large stones.	Severe: large stones.	Severe: large stones, small stones.	Moderate: large stones.
47: Ozette	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
48*:				
Ozette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Andeptic Udorthents	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
49, 50, 51: Palix	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
52*. Pits				
53: Puget	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding.	Slight.
54: Queets	Severe: flooding.	Slight	Moderate: slope.	Slight.
55*:				
Queets	Severe: flooding.	Slight	Moderate: slope.	Slight.
Tealwhit	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.
56: Quillayute	Slight	Slight	Moderate: slope.	Severe: erodes easily.
57*. Riverwash				
58: Sadie	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.
59: Schnorbush	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.
60, 61: Schnorbush	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
62*:				
Schnorbush	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.

See footnote at end of table.

TABLE 7.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
62*:				
Casey	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, small stones, wetness.	Slight.
63 Sequim	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight.
64*:				
Sequim	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight.
McKenna	Severe: ponding.	Severe: ponding.	Severe: small stones, ponding.	Severe: ponding.
Mukilteo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
65 Snahopish	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.
66 Solduc	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight.
67, 68 Solleks	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.
69 Tealwhit	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.
70, 71 Terbies	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
72*:				
Terbies	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.
Rock outcrop.				
73 Typic Xerofluvents	Severe: flooding.	Moderate: dusty.	Moderate: slope, flooding, dusty.	Severe: erodes easily.
74 Wellman	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
75 Yeary	Moderate: small stones, wetness.	Moderate: wetness, small stones.	Severe: slope, small stones.	Moderate: wetness, dusty.
76 Yeary	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
77 Zeeka	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: wetness, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1------------------ Agnew	Fair	Fair	Good	Fair	Fair	Good	Poor	Very poor.	Good	---	Very poor.	---
2------------------ Andeptic Udorthents	Very poor.	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	---
3*. Beaches												
4------------------ Bellingham	Poor	Poor	Fair	Fair	Poor	Fair	Good	Good	Poor	Fair	Good	---
5------------------ Calawah	Good	Good	Good	Fair	Good	Good	Poor	Very poor.	Good	Good	Very poor.	---
6------------------ Carlsborg	Poor	Poor	Fair	Poor	Poor	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	---
7*:												
Carlsborg----------	Poor	Poor	Fair	Poor	Poor	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	---
Dungeness----------	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	---
8------------------ Casey	Fair	Fair	Good	Fair	Fair	Good	Poor	Very poor.	Fair	Good	Very poor.	---
9------------------ Cassolary	Good	Good	Good	Fair	Fair	Good	Poor	Very poor.	Good	---	Very poor.	---
10----------------- Catla	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
11*:												
Catla--------------	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Hoypus-------------	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
12----------------- Clallam	Poor	Fair	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.	---
13----------------- Clallam	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	---
14*:												
Clallam------------	Poor	Fair	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.	---
Hoypus-------------	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
15----------------- Clallam Variant	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Good	Good	Very poor.	---
16----------------- Dick	Poor	Poor	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	---
17----------------- Dungeness	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	---

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
18------------------ Dystric Xerorthents	Very poor.	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
19------------------ Dystric Xerorthents	Very poor.	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
20, 21------------- Elwha	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	---
22------------------ Hoh	Fair	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	---
23, 24------------- Hoypus	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
25------------------ Hoypus	Very poor.	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
26------------------ Hyas	Very poor.	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
27------------------ Ilwaco	Fair	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	---
28*:												
Ilwaco------------	Very poor.	Very poor.	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	---
Klone-------------	Very poor.	Very poor.	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	---
29------------------ Klone	Poor	Fair	Good	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.	---
30------------------ Klone	Very poor.	Very poor.	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	---
31*:												
Klone-------------	Poor	Fair	Good	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.	---
Ozette------------	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	---
Tealwhit----------	Poor	Poor	Fair	Fair	Fair	Fair	Good	Good	Poor	Fair	Good	---
32------------------ Kydaka	Poor	Poor	Fair	Poor	Poor	Fair	Good	Good	Poor	Fair	Good	---
33*:												
Kydaka------------	Poor	Poor	Fair	Poor	Poor	Fair	Good	Good	Poor	Fair	Good	---
Zeeka-------------	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Good	Good	Very poor.	---
34------------------ Louella	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Good	Good	Very poor.	---
35------------------ Louella	Poor	Fair	Good	Fair	Fair	Good	Very poor.	Very poor.	Fair	Good	Very poor.	---
36------------------ Louella	Very poor.	Very poor.	Good	Fair	Fair	Good	Very poor.	Very poor.	Poor	Good	Very poor.	---

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
37----------------- Louella Variant	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	---
38----------------- Lummi	Very poor.	Poor	Fair	Fair	Fair	Fair	Good	Good	Poor	Fair	Good	---
39, 40------------- Lyre	Poor	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	---
41----------------- Makah	Very poor.	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
42----------------- McKenna	Poor	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good	---
43----------------- Mukilteo	Very poor.	Poor	Fair	Poor	Poor	Poor	Good	Good	Poor	Poor	Good	---
44----------------- Neilton	Very poor.	Very poor.	Fair	Good	Good	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	---
45----------------- Neilton	Poor	Poor	Fair	Good	Good	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
46----------------- Neilton	Very poor.	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
47----------------- Ozette	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	---
48*: Ozette------------	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	
Andeptic Udorthents-------	Very poor.	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	---
49, 50, 51--------- Palix	Very poor.	Very poor.	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	---
52*. Pits												
53----------------- Puget	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good	Fair	Fair	---
54----------------- Queets	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	---
55*: Queets------------	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	---
Tealwhit----------	Poor	Poor	Fair	Fair	Fair	Fair	Good	Good	Poor	Fair	Good	---
56----------------- Quillayute	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	---
57*. Riverwash												
58----------------- Sadie	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	---
59----------------- Schnorbush	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	---

See footnote at end of table.

TABLE 8.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hard-wood trees	Conif-erous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Open-land wild-life	Wood-land wild-life	Wetland wild-life	Range-land wild-life
60: Schnorbush	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	---
61: Schnorbush	Very poor.	Very poor.	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	---
62*:												
Schnorbush	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	---
Casey	Fair	Fair	Good	Fair	Fair	Good	Poor	Very poor.	Fair	Good	Very poor.	---
63: Sequim	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	---	Very poor.	---
64*:												
Sequim	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	---	Very poor.	---
McKenna	Poor	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good	---
Mukilteo	Very poor.	Poor	Fair	Poor	Poor	Poor	Good	Good	Poor	Poor	Good	---
65: Snahopish	Very poor.	Fair	Good	Fair	Fair	Good	Very poor.	Very poor.	Fair	Good	Very poor.	---
66: Solduc	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	---
67, 68: Solleks	Very poor.	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
69: Tealwhit	Poor	Poor	Fair	Fair	Fair	Fair	Good	Good	Poor	Fair	Good	---
70: Terbies	Poor	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
71: Terbies	Very poor.	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
72*:												
Terbies	Very poor.	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Rock outcrop.												
73: Typic Xerofluvents	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	---
74: Wellman	Fair	Fair	Good	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.	---
75: Yeary	Fair	Fair	Good	Fair	Fair	Good	Poor	Very poor.	Fair	Good	Very poor.	---
76: Yeary	Fair	Fair	Good	Fair	Fair	Good	Very poor.	Very poor.	Fair	Good	Very poor.	---
77: Zeeka	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Good	Good	Very poor.	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1 Agnew	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Slight.
2 Andeptic Udorthents	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
3*. Beaches						
4 Bellingham	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
5 Calawah	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
6 Carlsborg	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, large stones.	Severe: droughty.
7*:						
Carlsborg	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, large stones.	Severe: droughty.
Dungeness	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, low strength.	Slight.
8 Casey	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Slight.
9 Cassolary	Severe: cutbanks cave.	Slight	Moderate: wetness.	Moderate: slope.	Slight	Slight.
10 Catla	Severe: wetness.	Severe: wetness.	Severe: wetness, cemented pan.	Severe: wetness, slope.	Severe: wetness.	Severe: wetness, thin layer.
11*:						
Catla	Severe: wetness.	Severe: wetness.	Severe: wetness, cemented pan.	Severe: wetness, slope.	Severe: wetness.	Severe: wetness, thin layer.
Hoypus	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
12 Clallam	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness, slope.	Moderate: small stones, large stones, wetness.
13 Clallam	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
14*:						
Clallam	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness, slope.	Moderate: small stones, large stones, wetness.
Hoypus	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: droughty.
15 Clallam Variant	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
16 Dick	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: droughty.
17 Dungeness	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, low strength.	Slight.
18 Dystric Xerorthents	Severe: cutbanks cave, large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: small stones, large stones, droughty.
19 Dystric Xerorthents	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
20 Elwha	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness, slope.	Moderate: small stones, wetness, slope.
21 Elwha	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: slope.	Severe: slope.
22 Hoh	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
23 Hoypus	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: droughty.
24, 25 Hoypus	Severe: cutbanks cave, slope.	Severe: slope.	Severe. slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
26 Hyas	Severe: slope.	Severe: slope.	Severe: slope.	Severe. slope.	Severe: slope.	Severe: slope.
27 Ilwaco	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
28*:						
Ilwaco	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Klone	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
29 Klone	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: small stones.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
31*:						
Ozette	Moderate: wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Tealwhit	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness.	Severe: wetness.
32 Kydaka	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
33*:						
Kydaka	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Zeeka	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: wetness, slope, thin layer.
34, 35, 36 Louella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
37 Louella Variant	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: small stones, droughty.
38 Lummi	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness.	Severe: wetness.
39 Lyre	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: small stones.
40 Lyre	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
41 Makah	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
42 McKenna	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding.
43 Mukilteo	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, excess humus.
44, 45 Neilton	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
46 Neilton	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Severe: large stones, droughty.
47 Ozette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
48*:						
Ozette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
48*:						
Andeptic Udorthents	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
49, 50, 51 Palix	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: low strength, slope, slippage.	Severe: slope.
52*. Pits						
53 Puget	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding.	Moderate: wetness, flooding.
54 Queets	Slight	Severe. flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding.	Slight.
55*:						
Queets	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding.	Slight.
Tealwhit	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness.	Severe: wetness.
56 Quillayute	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
57*. Riverwash						
58 Sadie	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: slope.	Severe: slope.
59 Schnorbush	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.
60, 61 Schnorbush	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
62*:						
Schnorbush	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.
Casey	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Slight.
63 Sequim	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Severe: small stones, droughty.
64*:						
Sequim	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Severe: small stones, droughty.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
64*:						
McKenna	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding.
Mukilteo	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, excess humus.
65 Snahopish	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
66 Solduc	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Severe: small stones.
67, 68 Solleks	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
69 Tealwhit	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness.	Severe: wetness.
70, 71 Terbies	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
72*:						
Terbies	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
Rock outcrop.						
73 Typic Xerofluvents	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: droughty.
74 Wellman	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: low strength.	Moderate: small stones.
75 Yeary	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Moderate: wetness, slope.	Moderate: low strength, wetness, slope.	Moderate: small stones, wetness, slope.
76 Yeary	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: slope.	Severe: slope.
77 Zeeka	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1 Agnew	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
2 Andeptic Udorthents	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
3*. Beaches					
4 Bellingham	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
5 Calawah	Moderate: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Slight	Poor: hard to pack.
6 Carlsborg	Severe: poor filter.	Severe: seepage, flooding.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
7*: Carlsborg	Severe: poor filter.	Severe: seepage, flooding.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Dungeness	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: flooding.	Good.
8 Casey	Severe: wetness, percs slowly.	Severe: wetness.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
9 Cassolary	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Slight	Fair: too clayey, wetness.
10 Catla	Severe: cemented pan, wetness.	Severe: cemented pan, slope, wetness.	Severe: wetness.	Severe: cemented pan, wetness.	Poor: area reclaim, wetness.
11*: Catla	Severe: cemented pan, wetness.	Severe: cemented pan, slope, wetness.	Severe: wetness.	Severe: cemented pan, wetness.	Poor: area reclaim, wetness.
Hoypus	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
12 Clallam	Severe: cemented pan, wetness.	Severe: cemented pan, slope, wetness.	Severe: wetness.	Severe: cemented pan.	Poor: area reclaim, seepage, small stones.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
13------------------- Clallam	Severe: cemented pan, wetness, slope.	Severe: cemented pan, slope, wetness.	Severe: wetness, slope.	Severe: cemented pan, slope.	Poor: area reclaim, seepage, small stones.
14*:					
Clallam-------------	Severe: cemented pan, wetness.	Severe: cemented pan, slope, wetness.	Severe: wetness.	Severe: cemented pan.	Poor: area reclaim, seepage, small stones.
Hoypus--------------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
15------------------- Clallam Variant	Severe: cemented pan, wetness, slope.	Severe: cemented pan, slope, wetness.	Severe: slope.	Severe: cemented pan, slope.	Poor: area reclaim, small stones, slope.
16------------------- Dick	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
17------------------- Dungeness	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: flooding.	Good.
18------------------- Dystric Xerorthents	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: seepage, large stones, slope.
19------------------- Dystric Xerorthents	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope, small stones.
20------------------- Elwha	Severe: cemented pan, wetness.	Severe: cemented pan, slope, wetness.	Severe: wetness.	Severe: cemented pan.	Poor: area reclaim, small stones.
21------------------- Elwha	Severe: cemented pan, wetness, slope.	Severe: cemented pan, slope, wetness.	Severe: wetness, slope.	Severe: cemented pan, slope.	Poor: area reclaim, small stones, slope.
22------------------- Hoh	Severe: flooding.	Severe: flooding.	Severe: flooding, too sandy.	Severe: flooding.	Poor: seepage, too sandy, small stones.
23------------------- Hoypus	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
24, 25--------------- Hoypus	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
26------------------- Hyas	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: hard to pack, small stones, slope.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
27----------------- Ilwaco	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: hard to pack, slope.
28*:					
Ilwaco-------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: hard to pack, slope.
Klone--------------	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: small stones, slope.
29----------------- Klone	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Slight------------	Poor: small stones.
30----------------- Klone	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: small stones, slope.
31*:					
Klone--------------	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Slight------------	Poor: small stones.
Ozette-------------	Severe: wetness.	Severe: slope, wetness.	Moderate: cemented pan, wetness, slope.	Moderate: cemented pan, slope.	Fair: small stones, slope.
Tealwhit-----------	Severe: wetness, percs slowly.	Severe: flooding, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
32----------------- Kydaka	Severe: cemented pan, wetness, percs slowly.	Severe: cemented pan, wetness.	Severe: wetness.	Severe: cemented pan, wetness.	Poor: area reclaim, hard to pack, wetness.
33*:					
Kydaka-------------	Severe: cemented pan, wetness, percs slowly.	Severe: cemented pan, wetness.	Severe: wetness.	Severe: cemented pan, wetness.	Poor: area reclaim, hard to pack, wetness.
Zeeka--------------	Severe: cemented pan, wetness, percs slowly.	Severe: cemented pan, slope, wetness.	Severe: wetness.	Severe: cemented pan.	Poor: area reclaim.
34, 35, 36---------- Louella	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
37----------------- Louella Variant	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: small stones.
38----------------- Lummi	Severe: wetness.	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
39----------------- Lyre	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
40------------------ Lyre	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
41------------------ Makah	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
42------------------ McKenna	Severe: cemented pan, ponding, percs slowly.	Severe: cemented pan, ponding.	Severe: ponding.	Severe: cemented pan, ponding.	Poor: area reclaim, small stones, ponding.
43------------------ Mukilteo	Severe: ponding.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding.	Poor: ponding, excess humus.
44, 45-------------- Neilton	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
46------------------ Neilton	Severe: poor filter.	Severe: seepage, large stones.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
47------------------ Ozette	Severe: wetness, slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope.	Poor: slope.
48*:					
Ozette--------------	Severe: wetness, slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope.	Poor: slope.
Andeptic Udorthents	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
49, 50, 51---------- Palix	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: hard to pack, slope.
52*. Pits					
53------------------ Puget	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack.
54------------------ Queets	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: flooding.	Good.
55*:					
Queets--------------	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: flooding.	Good.
Tealwhit------------	Severe: wetness, percs slowly.	Severe: flooding, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
56------------------ Quillayute	Moderate: percs slowly.	Moderate: seepage, slope, excess humus.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
57*. Riverwash					
58------------------ Sadic	Severe: cemented pan, wetness, slope.	Severe: cemented pan, slope, wetness.	Severe: slope.	Severe: cemented pan, slope.	Poor: area reclaim, small stones, slope.
59------------------ Schnorbush	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
60, 61----- Schnorbush	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
62*:					
Schnorbush---------	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Casey--------------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
63------------------ Sequim	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy, large stones.	Severe: seepage.	Poor: seepage, too sandy, small stones.
64*:					
Sequim-------------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy, large stones.	Severe: seepage.	Poor: seepage, too sandy, small stones.
McKenna------------	Severe: cemented pan, ponding, percs slowly.	Severe: cemented pan, ponding.	Severe: ponding.	Severe: cemented pan, ponding.	Poor: area reclaim, small stones, ponding.
Mukilteo-----------	Severe: ponding.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding.	Poor: ponding, excess humus.
65------------------ Snahopish	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
66------------------ Solduc	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy, large stones.	Severe: seepage.	Poor: seepage, too sandy, small stones.
67, 68-------------- Solleks	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
69------------------ Tealwhit	Severe: wetness, percs slowly.	Severe: flooding, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
70, 71---------------- Terbies	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: small stones, slope.
72*:					
Terbies--------------	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: small stones, slope.
Rock outcrop.					
73------------------- Typic Xerofluvents	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy, small stones.
74------------------- Wellman	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
75------------------- Yeary	Severe: cemented pan, wetness, percs slowly.	Severe: cemented pan, slope, wetness.	Severe: wetness.	Severe: cemented pan.	Poor: area reclaim.
76------------------- Yeary	Severe: cemented pan, wetness, percs slowly.	Severe: cemented pan, slope, wetness.	Severe: wetness, slope.	Severe: cemented pan, slope.	Poor: area reclaim, slope.
77------------------- Zeeka	Severe: cemented pan, wetness, percs slowly.	Severe: cemented pan, slope, wetness.	Severe: wetness, slope.	Severe: cemented pan, slope.	Poor: area reclaim, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1----------------------- Agnew	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
2----------------------- Andeptic Udorthents	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
3*. Beaches				
4----------------------- Bellingham	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, thin layer, wetness.
5----------------------- Calawah	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
6----------------------- Carlsborg	Fair: large stones.	Probable--------------	Probable--------------	Poor: large stones, small stones, area reclaim.
7*:				
Carlsborg-------------	Fair: large stones.	Probable--------------	Probable--------------	Poor: large stones, small stones, area reclaim.
Dungeness-------------	Good------------------	Improbable: excess fines.	Improbable: excess fines.	Good.
8----------------------- Casey	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
9----------------------- Cassolary	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
10---------------------- Catla	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, wetness.
11*:				
Catla-----------------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, wetness.
Hoypus----------------	Poor: slope.	Probable--------------	Probable--------------	Poor: small stones, area reclaim, slope.
12---------------------- Clallam	Fair: wetness.	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones.
13---------------------- Clallam	Fair: wetness, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
14*:				
Clallam	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Hoypus	Good	Probable	Probable	Poor: small stones, area reclaim.
15 Clallam Variant	Poor: wetness, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
16 Dick	Good	Probable	Improbable: too sandy.	Poor: too sandy.
17 Dungeness	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
18 Dystric Xerorthents	Poor: large stones, slope.	Improbable: large stones.	Improbable: large stones.	Poor: large stones, area reclaim, slope.
19 Dystric Xerorthents	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
20 Elwha	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
21 Elwha	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
22 Hoh	Good	Probable	Probable	Poor: small stones, area reclaim.
23 Hoypus	Good	Probable	Probable	Poor: small stones, area reclaim.
24 Hoypus	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
25 Hoypus	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
26 Hyas	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
27 Ilwaco	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
28*:				
Ilwaco	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
28*:				
Klone	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
29 Klone	Good	Probable	Probable	Poor: small stones, area reclaim.
30 Klone	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
31*:				
Klone	Good	Probable	Probable	Poor: small stones, area reclaim.
Ozette	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Tealwhit	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
32 Kydaka	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
33*:				
Kydaka	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
Zeeka	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
34 Louella	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
35, 36 Louella	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
37 Louella Variant	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
38 Lummi	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
39 Lyre	Good	Probable	Probable	Poor: small stones, area reclaim.
40 Lyre	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
41 Makah	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
42 McKenna	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
43 Mukilteo	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
44 Neilton	Poor: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
45 Neilton	Fair: large stones, slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
46 Neilton	Fair: large stones.	Probable	Probable	Poor: small stones, area reclaim.
47 Ozette	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
48*:				
Ozette	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Andeptic Udorthents	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
49, 50, 51 Palix	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
52*. Pits				
53 Puget	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
54 Queets	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
55*:				
Queets	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Tealwhit	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
56 Quillayute	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
57*. Riverwash				
58 Sadie	Fair: wetness, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
59-------------------- Schnorbush	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
60, 61---------------- Schnorbush	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
62*:				
Schnorbush-----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Casey----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
63-------------------- Sequim	Fair: large stones.	Probable------------	Probable------------	Poor: small stones, area reclaim.
64*:				
Sequim---------------	Fair: large stones.	Probable------------	Probable------------	Poor: small stones, area reclaim.
McKenna--------------	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness.
Mukilteo-------------	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
65-------------------- Snahopish	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
66-------------------- Solduc	Fair: large stones.	Probable------------	Probable------------	Poor: small stones, area reclaim.
67, 68---------------- Solleks	Poor: area reclaim, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, slope.
69-------------------- Tealwhit	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
70, 71---------------- Terbies	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
72*:				
Terbies--------------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
73-------------------- Typic Xerofluvents	Good----------------	Probable------------	Probable------------	Poor: too sandy, small stones, area reclaim.
74-------------------- Wellman	Good----------------	Probable------------	Probable------------	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
75 Yeary	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
76 Yeary	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
77 Zeeka	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions
1 Agnew	Moderate: slope.	Moderate: piping, wetness.	Severe: no water.	Slope	Wetness, percs slowly, slope.	Erodes easily, wetness.
2 Andeptic Udorthents	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope	Slope, too sandy.
3*. Beaches						
4 Bellingham	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly.
5 Calawah	Moderate: seepage, slope.	Severe: piping, hard to pack.	Severe: no water.	Deep to water	Slope	Favorable.
6 Carlsborg	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty.	Large stones, too sandy.
7*:						
Carlsborg	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty.	Large stones, too sandy.
Dungeness	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
8 Casey	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Wetness, percs slowly, slope.	Wetness, percs slowly.
9 Cassolary	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily.
10 Catla	Severe: cemented pan, slope.	Severe: wetness.	Severe: no water.	Cemented pan, slope.	Wetness, droughty, cemented pan.	Slope, cemented pan, wetness.
11*:						
Catla	Severe: cemented pan, slope.	Severe: wetness.	Severe: no water.	Cemented pan, slope.	Wetness, droughty, cemented pan.	Slope, cemented pan, wetness.
Hoypus	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, too sandy.
12 Clallam	Moderate: seepage, cemented pan, slope.	Severe: seepage.	Severe: no water.	Cemented pan, slope.	Wetness, droughty, cemented pan.	Slope, cemented pan, wetness.
13 Clallam	Severe: slope.	Severe: seepage.	Severe: no water.	Cemented pan, slope.	Wetness, droughty, cemented pan.	Slope, cemented pan, wetness.
14*:						
Clallam	Moderate: seepage, cemented pan, slope.	Severe: seepage.	Severe: no water.	Cemented pan, slope.	Wetness, droughty, cemented pan.	Slope, cemented pan, wetness.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions
14*:						
Hoypus-----------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, slope.	Slope, too sandy.
15---------------- Clallam Variant	Severe: slope.	Severe: seepage.	Severe: no water.	Cemented pan, slope.	Wetness, cemented pan, slope.	Slope, cemented pan, wetness.
16---------------- Dick	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Too sandy, slope.
17---------------- Dungeness	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
18---------------- Dystric Xerorthents	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Slope, large stones, too sandy.
19---------------- Dystric Xerorthents	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, slope.	Slope, too sandy.
20---------------- Elwha	Moderate: seepage, cemented pan, slope.	Moderate: seepage, wetness.	Severe: no water.	Cemented pan, slope.	Wetness, droughty, cemented pan.	Slope, cemented pan, wetness.
21---------------- Elwha	Severe: slope.	Moderate: seepage, wetness.	Severe: no water.	Cemented pan, slope.	Wetness, droughty, cemented pan.	Slope, cemented pan, wetness.
22---------------- Hoh	Moderate: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Erodes easily, flooding.	Erodes easily, too sandy.
23, 24------------ Hoypus	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, slope.	Slope, too sandy.
25---------------- Hoypus	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, too sandy.
26---------------- Hyas	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope-----------	Slope.
27---------------- Ilwaco	Severe: slope.	Severe: piping, hard to pack.	Severe: no water.	Deep to water	Slope-----------	Slope.
28*:						
Ilwaco-----------	Severe: slope.	Severe: piping, hard to pack.	Severe: no water.	Deep to water	Slope-----------	Slope.
Klone------------	Severe: slope.	Moderate: large stones.	Severe: no water.	Deep to water	Slope-----------	Slope, large stones.
29, 30------------ Klone	Severe: seepage, slope.	Moderate: large stones.	Severe: no water.	Deep to water	Slope-----------	Slope, large stones.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions
31*:						
Klone	Severe: seepage, slope.	Moderate: large stones.	Severe: no water.	Deep to water	Slope	Slope, large stones.
Ozette	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope.
Tealwhit	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.
32 Kydaka	Moderate: cemented pan.	Severe: piping, hard to pack, wetness.	Slight	Percs slowly, cemented pan, slope.	Wetness, percs slowly, cemented pan.	Cemented pan, wetness, percs slowly.
33*:						
Kydaka	Moderate: cemented pan.	Severe: piping, hard to pack, wetness.	Slight	Percs slowly, cemented pan, slope.	Wetness, percs slowly, cemented pan.	Cemented pan, wetness, percs slowly.
Zeeka	Severe: slope.	Severe: piping.	Severe: no water.	Cemented pan, slope.	Wetness, cemented pan, slope.	Slope, cemented pan, wetness.
34, 35, 36 Louella	Severe: slope.	Slight	Severe: no water.	Deep to water	Slope	Slope.
37 Louella Variant	Severe: slope.	Slight	Severe: no water.	Deep to water	Droughty, slope.	Slope.
38 Lummi	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Favorable	Wetness, erodes easily.	Erodes easily, wetness.
39 Lyre	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, slope.	Large stones, too sandy.
40 Lyre	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, slope.	Slope, large stones, too sandy.
41 Makah	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope.
42 McKenna	Moderate: cemented pan.	Severe: thin layer, ponding.	Severe: no water.	Ponding, percs slowly, cemented pan.	Ponding, percs slowly, cemented pan.	Cemented pan, ponding, percs slowly.
43 Mukilteo	Moderate: seepage.	Severe: excess humus, ponding.	Moderate: slow refill.	Ponding, subsides.	Ponding	Ponding.
44 Neilton	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Large stones, droughty, fast intake.	Slope, large stones, too sandy.
45 Neilton	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Slope, large stones, too sandy.
46 Neilton	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty.	Large stones, too sandy.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions
47 Ozette	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope.
48*: Ozette	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope.
Andeptic Udorthents	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope	Slope, too sandy.
49, 50, 51 Palix	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
52*. Pits						
53 Puget	Slight	Severe: piping, hard to pack.	Moderate: slow refill.	Flooding	Wetness, percs slowly, flooding.	Wetness.
54 Queets	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable.
55*: Queets	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable.
Tealwhit	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.
56 Quillayute	Moderate: seepage, slope.	Slight	Severe: no water.	Deep to water	Slope	Favorable.
57*. Riverwash						
58 Sadie	Severe: slope.	Severe: piping.	Severe: no water.	Cemented pan, slope.	Wetness, cemented pan, slope.	Slope, cemented pan, wetness.
59, 60, 61 Schnorbush	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
62*: Schnorbush	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Casey	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Wetness, percs slowly, slope.	Wetness, percs slowly.
63 Sequim	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty.	Large stones, too sandy.
64*: Sequim	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, droughty.	Large stones, too sandy.
McKenna	Moderate: cemented pan.	Severe: thin layer, ponding.	Severe: no water.	Ponding, percs slowly, cemented pan.	Ponding, percs slowly, cemented pan.	Cemented pan, ponding, percs slowly.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions
64*:						
Mukilteo	Moderate: seepage.	Severe: excess humus, ponding.	Moderate: slow refill.	Ponding, subsides.	Ponding	Ponding.
65 Snahopish	Severe: slope.	Moderate: seepage, large stones.	Severe: no water.	Deep to water	Large stones, slope.	Slope, large stones.
66 Solduc	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Large stones, slope.	Large stones, too sandy.
67, 68 Solleks	Severe: slope.	Severe: large stones, thin layer.	Severe: no water.	Deep to water	Large stones, depth to rock, slope.	Slope, large stones, depth to rock.
69 Tealwhit	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.
70, 71 Terbies	Severe: slope.	Severe: seepage.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Slope, large stones.
72*:						
Terbies	Severe: slope.	Severe: seepage.	Severe: no water.	Deep to water	Large stones, droughty, slope.	Slope, large stones.
Rock outcrop.						
73 Typic Xerofluvents	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Droughty, erodes easily.	Large stones, erodes easily, too sandy.
74 Wellman	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Favorable	Too sandy.
75 Yeary	Moderate: cemented pan, slope.	Moderate: piping, wetness.	Severe: no water.	Cemented pan, slope.	Wetness, cemented pan, slope.	Slope, cemented pan, wetness.
76 Yeary	Severe: slope.	Moderate: piping, wetness.	Severe: no water.	Cemented pan, slope.	Wetness, cemented pan, slope.	Slope, cemented pan, wetness.
77 Zeeka	Severe: slope.	Severe: piping.	Severe: no water.	Cemented pan, slope.	Wetness, cemented pan, slope.	Slope, cemented pan, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
1----------------- Agnew	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	90-100	85-95	65-90	20-30	5-15
	8-46	Silt loam, silty clay loam, clay loam.	CL	A-6	0	95-100	90-100	85-95	65-85	25-35	10-20
	46-60	Stratified sandy loam to silty clay loam.	CL, CL-ML	A-6, A-4	0	95-100	95-100	60-90	50-80	20-30	5-15
2----------------- Andeptic Udorthents	0-7	Gravelly silt loam.	GM, ML, SM	A-6, A-7, A-4, A-5	0-10	60-75	55-75	40-60	35-60	30-45	NP-15
	7-60	Very gravelly silt loam, very gravelly sandy loam, very gravelly loamy sand.	GM, GM-GC	A-2, A-4, A-1	0-15	40-55	35-50	15-50	10-40	20-30	NP-10
3*. Beaches											
4----------------- Bellingham	0-9	Silty clay loam	OL, OH, ML, MH	A-7	0	100	100	90-100	60-100	40-55	15-25
	9-60	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	95-100	95-100	85-100	45-65	20-40
5----------------- Calawah	0-10	Silt loam--------	ML, MH, OH, OL	A-7, A-5	0	95-100	95-100	80-100	70-90	45-70	5-20
	10-46	Silt loam, silty clay loam.	ML, MH	A-7, A-5, A-4	0	95-100	95-100	80-100	70-95	35-65	5-20
	46-60	Gravelly silty clay loam, gravelly silt loam.	ML, MH	A-5, A-7, A-4	0-15	75-90	60-75	60-75	50-70	35-65	5-20
6----------------- Carlsborg	0-9	Gravelly sandy loam.	SM	A-1, A-2, A-4	0-10	65-80	55-75	35-50	15-40	---	NP
	9-20	Very gravelly loamy sand, very cobbly loamy sand.	SP-SM, SM	A-1	15-35	55-65	35-55	20-40	5-20	---	NP
	20-60	Extremely gravelly loamy sand, extremely cobbly loamy sand, extremely gravelly sand.	GP, GP-GM	A-1	35-50	20-55	10-35	5-30	0-10	---	NP
7*: Carlsborg--------	0-9	Gravelly sandy loam.	SM	A-1, A-2, A-4	0-10	65-80	55-75	35-50	15-40	---	NP
	9-20	Very gravelly loamy sand, very cobbly loamy sand.	SP-SM, SM	A-1	15-35	55-65	35-55	20-40	5-20	---	NP
	20-60	Extremely gravelly loamy sand, extremely cobbly loamy sand, extremely gravelly sand.	GP, GP-GM	A-1	35-50	20-55	10-35	5-30	0-10	---	NP

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
7*:											
Dungeness-------	0-8	Silt loam--------	ML	A-4	0	100	95-100	85-100	80-100	15-20	NP-5
	8-42	Stratified fine sandy loam to silty clay loam.	ML	A-4	0	100	95-100	95-100	85-95	15-20	NP-5
	42-60	Stratified coarse sand to silt loam.	SM, ML	A-2, A-4	0	85-100	75-100	40-85	30-60	---	NP
8---------------- Casey	0-8	Silty clay loam	CL	A-6, A-7	0	95-100	85-100	80-100	75-95	35-45	15-20
	8-36	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	95-100	85-100	80-100	75-95	40-60	15-30
	36-60	Stratified clay to loamy fine sand.	CL, CH	A-7	0	95-100	85-100	80-100	65-95	40-60	15-30
9---------------- Cassolary	0-8	Fine sandy loam	SM	A-2, A-4	0	95-100	90-100	50-70	25-40	15-20	NP-5
	8-22	Very fine sandy loam, sandy loam, fine sandy loam.	CL-ML, ML	A-4	0	95-100	90-100	60-90	50-70	15-30	NP-10
	22-60	Stratified fine sandy loam to silty clay loam.	SM-SC, CL-ML, CL, SC	A-4, A-6	0	95-100	85-100	75-90	35-80	15-40	5-20
10--------------- Catla	0-3	Gravelly sandy loam.	SM	A-2	0-5	85-95	55-75	40-55	25-35	---	NP
	3-14	Gravelly sandy loam, gravelly loam, gravelly fine sandy loam.	SM	A-2, A-4	0-5	85-95	55-75	30-60	25-45	20-30	NP-5
	14	Cemented---------	---	---	---	---	---	---	---	---	---
11*:											
Catla-----------	0-3	Gravelly sandy loam.	SM	A-2	0-5	85-95	55-75	40-55	25-35	---	NP
	3-14	Gravelly sandy loam, gravelly loam, gravelly fine sandy loam.	SM	A-2, A-4	0-5	85-95	55-75	30-60	25-45	20-30	NP-5
	14	Cemented---------	---	---	---	---	---	---	---	---	---
Hoypus----------	0-4	Gravelly loamy sand.	SM	A-1	0	60-80	50-75	25-50	10-20	---	NP
	4-15	Gravelly sandy loam, very gravelly loamy sand, gravelly loamy sand.	GM, SM	A-1	0-15	55-65	40-55	25-40	15-25	---	NP
	15-60	Very gravelly loamy sand, very gravelly sand.	GP, GP-GM, SP, SP-SM	A-1	0-5	40-60	30-50	15-30	0-15	---	NP
12, 13----------- Clallam	0-10	Gravelly sandy loam.	SM	A-1, A-2	0-10	70-90	60-75	40-60	15-35	---	NP
	10-28	Very gravelly sandy loam, very gravelly loam.	GM, GP-GM	A-1	5-15	35-55	25-45	15-35	5-25	---	NP
	28	Cemented---------	---	---	---	---	---	---	---	---	---
14*:											
Clallam---------	0-10	Gravelly sandy loam.	SM	A-1, A-2	0-10	70-90	60-75	40-60	15-35	---	NP
	10-28	Very gravelly sandy loam, very gravelly loam.	GM, GP-GM	A-1	5-15	35-55	25-45	15-35	5-25	---	NP
	28	Cemented---------	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
14*:											
Hoypus----------	0-3	Gravelly sandy loam.	SM	A-1, A-2	0	60-80	50-75	30-50	15-30	---	NP
	3-10	Gravelly sandy loam, very gravelly loamy sand, gravelly loamy sand.	GM, SM	A-1	0-15	55-65	40-55	25-40	15-25	---	NP
	10-31	Very gravelly loamy sand, very gravelly fine sand, very gravelly sand.	GP-GM, GM	A-1	0-5	35-55	25-45	15-40	5-15	---	NP
	31-45	Very gravelly loamy sand, very gravelly sand.	GP, GP-GM, SP, SP-SM	A-1	0-5	40-60	30-50	15-30	0-15	---	NP
	45-60	Gravelly sand, very gravelly sand.	GM, SM, GP-GM, SP-SM	A-1	0-15	50-80	40-75	20-40	5-15	---	NP
15--------------- Clallam Variant	0-7	Gravelly loam----	SM-SC	A-2, A-4	0	75-90	50-75	40-60	30-50	20-30	5-10
	7-15	Gravelly loam, very gravelly loam, very gravelly sandy loam.	SM-SC, SM	A-1, A-2	0-15	60-80	40-60	25-45	15-35	15-30	NP-10
	15-30	Very gravelly loam, very gravelly sandy loam.	SM-SC, SM, GM, GM-GC	A-1, A-2	0-15	40-70	30-45	20-40	15-30	15-30	NP-10
	30	Cemented---------	---	---	---	---	---	---	---	---	---
16--------------- Dick	0-3	Loamy sand-------	SM	A-1, A-2	0	95-100	85-100	45-60	10-35	---	NP
	3-22	Loamy sand, fine sand, sand.	SM, SP-SM	A-1, A-2, A-3	0	95-100	85-100	40-60	5-35	---	NP
	22-48	Stratified sand to loamy sand.	SM, SP-SM	A-1, A-2, A-3	0	95-100	85-100	40-55	5-30	---	NP
	48-60	Stratified gravelly sand to loamy sand.	SM, SP-SM	A-1	0	80-95	60-90	35-45	5-25	---	NP
17--------------- Dungeness	0-8	Silt loam--------	ML	A-4	0	100	95-100	85-100	80-100	15-20	NP-5
	8-42	Stratified fine sandy loam to silty clay loam.	ML	A-4	0	100	95-100	95-100	85-95	15-20	NP-5
	42-60	Stratified coarse sand to silt loam.	SM, ML	A-2, A-4	0	85-100	75-100	40-85	30-60	---	NP
18--------------- Dystric Xerorthents	0-6	Extremely cobbly sandy loam.	GM	A-1	55-75	40-60	30-50	20-40	10-20	---	NP
	6-60	Extremely cobbly sandy loam, extremely cobbly loamy sand, extremely bouldery loamy sand.	GM, GW-GM	A-1	55-85	40-60	30-50	15-35	5-20	---	NP

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
19--------------- Dystric Xerorthents	0-3	Gravelly sandy loam.	SM	A-1, A-2	0	60-80	50-75	30-50	15-30	---	NP
	3-60	Gravelly sandy loam, very gravelly sandy loam, very gravelly loamy sand.	GM, SP-SM	A-1, A-2	0-5	45-65	35-60	15-45	10-30	---	NP
20, 21----------- Elwha	0-4	Gravelly sandy loam.	SM	A-1, A-2	0	80-90	60-75	35-55	20-35	15-20	NP-5
	4-33	Gravelly sandy loam, gravelly loam.	SM, SM-SC	A-2, A-4	0-10	75-85	55-75	40-60	25-50	15-25	NP-10
	33	Cemented---------	---	---	---	---	---	---	---	---	---
22--------------- Hoh	0-7	Silt loam--------	ML	A-4	0	95-100	85-100	75-100	60-90	---	NP
	7-21	Stratified silt loam to sand.	ML, SM	A-2, A-4	0	95-100	85-100	50-90	30-70	---	NP
	21-60	Stratified fine sandy loam to extremely gravelly coarse sand.	SM, GM, GP-GM, SP-SM	A-1, A-2	0	45-75	25-65	10-40	5-30	---	NP
23, 24----------- Hoypus	0-3	Gravelly sandy loam.	SM	A-1, A-2	0	60-80	50-75	30-50	15-30	---	NP
	3-10	Gravelly sandy loam, very gravelly loamy sand, gravelly loamy sand.	GM, SM	A-1	0-15	55-65	40-55	25-40	15-25	---	NP
	10-31	Very gravelly loamy sand, very gravelly fine sand, very gravelly sand.	GP-GM, GM	A-1	0-5	35-55	25-45	15-40	5-15	---	NP
	31-45	Very gravelly loamy sand, very gravelly sand.	GP, GP-GM, SP, SP-SM	A-1	0-5	40-60	30-50	15-30	0-15	---	NP
	45-60	Gravelly sand, very gravelly sand.	GM, SM, GP-GM, SP-SM	A-1	0-15	50-80	40-75	20-40	5-15	---	NP
25--------------- Hoypus	0-4	Gravelly loamy sand.	SM	A-1	0	60-80	50-75	25-50	10-20	---	NP
	4-15	Gravelly sandy loam, very gravelly loamy sand, gravelly loamy sand.	GM, SM	A-1	0-15	55-65	40-55	25-40	15-25	---	NP
	15-60	Very gravelly loamy sand, very gravelly sand.	GP, GP-GM, SP, SP-SM	A-1	0-5	40-60	30-50	15-30	0-15	---	NP
26--------------- Hyas	0-13	Gravelly loam----	ML, SM, MH	A-7, A-5	0-10	70-85	60-75	50-70	35-55	40-60	5-20
	13-38	Gravelly loam----	ML, SM, GM, MH	A-7, A-2, A-5	0-10	65-85	55-75	45-70	30-55	40-60	5-20
	38-60	Gravelly loam, very gravelly loam.	SM, GM	A-2, A-6, A-7, A-4	0-15	55-80	45-75	40-60	30-50	30-50	5-20
27--------------- Ilwaco	0-12	Silt loam--------	ML, MH, OL, OH	A-5, A-7	0	100	100	90-100	80-90	45-65	5-20
	12-60	Silt loam, loam	ML, MH	A-5, A-7	0	100	100	90-100	70-90	40-60	5-20

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
28*:											
Ilwaco	0-12	Silt loam	ML, MH, OL, OH	A-5, A-7	0	100	100	90-100	80-90	45-65	5-20
	12-60	Silt loam, loam	ML, MH	A-5, A-7	0	100	100	90-100	70-90	40-60	5-20
Klone	0-10	Very gravelly loam.	GM	A-2, A-7, A-5	0-15	40-70	25-50	20-45	15-40	40-60	5-25
	10-49	Very gravelly loam, very gravelly silt loam, very gravelly sandy loam.	GM, SM	A-2, A-7, A-5	10-20	45-75	35-50	25-50	20-45	40-60	5-25
	49-60	Extremely gravelly loamy sand, extremely gravelly sand, very cobbly sand.	GP, GP-GM, SP, SP-SM	A-1	10-35	30-60	20-50	15-30	0-10	---	NP
29, 30 Klone	0-10	Very gravelly loam.	GM	A-2, A-7, A-5	0-15	40-70	25-50	20-45	15-40	40-60	5-25
	10-49	Very gravelly loam, very gravelly silt loam, very gravelly sandy loam.	GM, SM	A-2, A-7, A-5	10-20	45-75	35-50	25-50	20-45	40-60	5-25
	49-60	Extremely gravelly loamy sand, extremely gravelly sand, very cobbly sand.	GP, GP-GM, SP, SP-SM	A-1	10-35	30-60	20-50	15-30	0-10	---	NP
31*:											
Klone	0-10	Very gravelly loam.	GM	A-2, A-7, A-5	0-15	40-70	25-50	20-45	15-40	40-60	5-25
	10-49	Very gravelly loam, very gravelly silt loam, very gravelly sandy loam.	GM, SM	A-2, A-7, A-5	10-20	45-75	35-50	25-50	20-45	40-60	5-25
	49-60	Extremely gravelly loamy sand, extremely gravelly sand, very cobbly sand.	GP, GP-GM, SP, SP-SM	A-1	10-35	30-60	20-50	15-30	0-10	---	NP
Ozette	0-18	Silt loam	ML, OL, MH, OH	A-7, A-5	0-5	95-100	85-100	75-100	60-90	40-60	5-20
	18-42	Silt loam, gravelly silt loam, gravelly loam.	ML, SM	A-6, A-4, A-5, A-7	0-10	75-90	60-85	50-80	40-70	30-50	5-15
	42	Cemented	---	---	---	---	---	---	---	---	---
Tealwhit	0-6	Silt loam	CL	A-6	0	100	100	85-100	75-90	25-35	10-15
	6-38	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	20-30
	38-60	Very fine sandy loam, silty clay, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	90-100	60-80	20-40	5-20

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
32---------------- Kydaka	0-5	Silty clay loam	ML, OL, MH, OH	A-7, A-5	0	95-100	90-100	80-100	80-95	40-60	5-25
	5-11	Silty clay loam	ML, MH	A-7, A-5	0	95-100	90-100	80-100	80-95	40-60	5-25
	11-21	Clay loam, gravelly clay loam, gravelly silty clay loam.	SM, ML, GM, MH	A-7, A-5	0-10	70-90	60-85	50-80	40-70	40-60	5-25
	21-30	Gravelly loam, gravelly clay loam, gravelly silty clay loam.	ML, GM	A-6, A-4, A-5, A-7	0-10	60-80	55-75	40-60	40-60	30-50	5-15
	30	Cemented---------	---	---	---	---	---	---	---	---	---
33*:											
Kydaka-----------	0-5	Silty clay loam	ML, OL, MH, OH	A-7, A-5	0	95-100	90-100	80-100	80-95	40-60	5-25
	5-11	Silty clay loam	ML, MH	A-7, A-5	0	95-100	90-100	80-100	80-95	40-60	5-25
	11-21	Clay loam, gravelly clay loam, gravelly silty clay loam.	SM, ML, GM, MH	A-7, A-5	0-10	70-90	60-85	50-80	40-70	40-60	5-25
	21-30	Gravelly loam, gravelly clay loam, gravelly silty clay loam.	ML, GM	A-6, A-4, A-5, A-7	0-10	60-80	55-75	40-60	40-60	30-50	5-15
	30	Cemented---------	---	---	---	---	---	---	---	---	---
Zeeka------------	0-6	Silt loam	ML	A-4, A-5, A-6, A-7	0	100	90-100	85-95	80-90	30-45	5-15
	6-26	Silt loam, gravelly silt loam.	ML	A-4, A-5 A-6, A-7	0-10	80-95	65-90	60-85	55-80	30-45	5-15
	26	Cemented---------	---	---	---	---	---	---	---	---	---
34, 35, 36------- Louella	0-11	Gravelly loam----	SM-SC, CL-ML	A-4	0	75-85	65-75	50-70	40-55	20-30	5-10
	11-47	Gravelly loam, gravelly clay loam.	SM	A-2, A-4	0	65-85	55-75	40-60	30-50	20-35	NP-10
	47-60	Gravelly loam, gravelly sandy loam, gravelly coarse sandy loam.	SM-SC, SM	A-2, A-4, A-1	0	65-85	55-75	30-60	20-50	15-25	NP-10
37---------------- Louella Variant	0-5	Very gravelly loam.	SC, GC	A-2, A-6	0	50-75	30-50	25-45	20-40	25-35	10-15
	5-60	Very gravelly loam, very gravelly clay loam.	GC	A-2, A-6	0	40-60	30-50	20-45	15-40	25-40	10-20
38---------------- Lummi	0-9	Silt loam--------	CL	A-6	0	100	95-100	90-100	85-100	25-35	10-15
	9-40	Stratified very fine sandy loam to silty clay loam.	CL-ML, CL	A-4, A-6	0	100	90-100	90-100	85-95	25-35	5-15
	40-60	Stratified silt loam to very fine sandy loam.	CL-ML, CL	A-4, A-6	0	100	90-100	90-100	85-95	25-35	5-15

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
39, 40----------- Lyre	0-5	Very gravelly sandy loam.	GM	A-1, A-2, A-5	0-15	40-60	30-50	20-40	10-25	25-45	NP-10
	5-30	Very gravelly sandy loam, extremely gravelly sandy loam.	GM	A-1, A-2, A-5	0-20	30-55	25-50	15-25	10-20	25-45	NP-10
	30-60	Very gravelly sand, very gravelly loamy sand, extremely gravelly sand.	GP, SP	A-1	10-35	30-55	20-45	10-20	0-5	---	NP
41--------------- Makah	0-14	Gravelly loam----	ML, SM, OL, MH, OH	A-7, A-5	0-10	80-90	65-75	60-75	40-60	40-60	5-20
	14-45	Gravelly loam----	ML, SM	A-4, A-5, A-6, A-7	0-10	70-90	60-75	50-75	35-60	30-50	5-15
	45-60	Gravelly loam, very gravelly loam.	GM, SM	A-2, A-4, A-5, A-7	0-15	65-80	45-75	40-65	30-50	30-50	5-15
42--------------- McKenna	0-8	Gravelly silt loam.	ML, GM	A-4	0-5	60-80	55-75	55-65	40-60	20-40	NP-10
	8-18	Gravelly silt loam, gravelly clay loam, gravelly loam.	GM-GC, GC, CL-ML, CL	A-4, A-6	0-5	65-90	55-75	45-65	40-60	25-40	5-15
	18-24	Very gravelly silt loam, very gravelly clay loam, very gravelly loam.	GM-GC, GC	A-2, A-4, A-6, A-7	0-5	30-60	25-50	20-50	20-45	25-45	5-20
	24-32	Very gravelly sandy loam.	GM-GC, GM	A-1, A-2	0-5	30-50	25-40	20-30	10-25	20-30	NP-10
	32	Cemented---------	---	---	---	---	---	---	---	---	---
43--------------- Mukilteo	0-10	Muck-------------	PT, OH	A-8	0	---	---	---	---	---	---
	10-60	Hemic material---	PT	A-8	0	---	---	---	---	---	---
44--------------- Neilton	0-4	Very gravelly loamy sand.	GM	A-1	0-10	45-60	40-50	20-35	10-20	---	NP
	4-23	Very gravelly loamy sand, extremely gravelly loamy sand, extremely cobbly sand.	GP-GM	A-1	20-45	40-50	20-50	10-25	5-10	---	NP
	23-60	Very gravelly loamy sand, extremely gravelly sand, very cobbly sand.	GP, GP-GM	A-1	10-35	35-55	20-50	10-25	0-10	---	NP
45--------------- Neilton	0-6	Very gravelly sandy loam.	GM	A-1	0-10	45-60	35-50	25-40	15-25	---	NP
	6-19	Very gravelly loamy sand, extremely gravelly loamy sand, extremely cobbly sand.	GP-GM	A-1	20-45	40-50	20-50	10-25	5-10	---	NP
	19-60	Very gravelly loamy sand, extremely gravelly sand, very cobbly sand.	GP, GP-GM	A-1	10-35	35-55	20-50	10-25	0-10	---	NP

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
46---------------- Neilton	0-6	Very cobbly sandy loam.	SM, GM	A-1, A-2	30-40	60-70	50-60	30-45	15-30	---	NP
	6-16	Very gravelly loamy sand, extremely gravelly loamy sand, extremely cobbly sand.	GP, GP-GM	A-1	20-45	35-55	25-50	10-35	0-10	---	NP
	16-60	Very gravelly sand, extremely cobbly sand.	GP, GP-GM	A-1	10-35	35-55	25-50	10-35	0-10	---	NP
47---------------- Ozette	0-18	Silt loam--------	ML, OL, MH, OH	A-7, A-5	0-5	95-100	85-100	75-100	60-90	40-60	10-20
	18-42	Silt loam, gravelly silt loam, gravelly loam.	ML, SM	A-6, A-4, A-5, A-7	0-10	75-90	60-85	50-80	40-70	30-50	5-15
	42	Cemented---------	---	---	---	---	---	---	---	---	---
48*: Ozette-----------	0-18	Silt loam--------	ML, OL, MH, OH	A-7, A-5	0-5	95-100	85-100	75-100	60-90	40-60	10-20
	18-42	Silt loam, gravelly silt loam, gravelly loam.	ML, SM	A-6, A-4, A-5, A-7	0-10	75-90	60-85	50-80	40-70	30-50	5-15
	42	Cemented---------	---	---	---	---	---	---	---	---	---
Andeptic Udorthents------	0-7	Gravelly silt loam.	GM, ML, SM	A-6, A-7, A-4, A-5	0-10	60-90	55-75	40-60	35-60	30-45	NP-15
	7-60	Very gravelly silt loam, very gravelly sandy loam, very gravelly loamy sand.	GM, GM-GC	A-2, A-4, A-1	0-15	40-55	35-50	15-50	10-40	20-30	NP-10
49, 50, 51-------- Palix	0-17	Loam-------------	ML, MH, OL, OH	A-5, A-7	0	100	100	70-80	55-60	45-65	5-20
	17-44	Silty clay loam, clay loam.	ML, MH	A-7	0	100	100	85-95	75-85	40-60	10-20
	44	Weathered bedrock	---	---	---	---	---	---	---	---	---
52*. Pits											
53---------------- Puget	0-9	Silt loam--------	ML	A-4, A-5, A-7, A-6	0	100	100	95-100	85-95	35-50	5-15
	9-60	Silty clay loam, silt loam.	MH, ML	A-5, A-7, A-4, A-6	0	100	100	95-100	85-95	35-70	5-25
54---------------- Queets	0-6	Silt loam--------	ML, MH	A-7, A-5	0	100	95-100	80-100	70-90	40-60	5-20
	6-60	Silt loam, very fine sandy loam.	ML	A-4	0	95-100	95-100	70-90	60-90	30-40	NP-10
55*: Queets-----------	0-6	Silt loam--------	ML, MH	A-7, A-5	0	100	95-100	80-100	70-90	40-60	5-20
	6-60	Silt loam, very fine sandy loam.	ML	A-4	0	95-100	95-100	70-90	60-90	30-40	NP-10
Tealwhit---------	0-6	Silt loam--------	CL	A-6	0	100	100	85-100	75-90	25-35	10-15
	6-38	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	20-30
	38-60	Very fine sandy loam, silty clay, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	90-100	60-80	20-40	5-20

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
56---------------- Quillayute	0-20	Silt loam--------	MH, OH	A-7	0	100	100	90-100	85-95	50-70	20-30
	20-32	Silty clay loam	ML	A-7	0	100	100	90-100	85-95	40-50	10-20
	32-60	Silty clay loam, silt loam.	ML	A-7	0	100	100	90-100	85-95	40-50	10-20
57*. Riverwash											
58---------------- Sadie	0-4	Gravelly loam----	SM, ML	A-4	0-10	70-90	65-75	50-70	40-60	25-40	NP-10
	4-30	Gravelly loam----	ML, SM	A-4	0-10	70-90	55-75	45-65	35-55	25-35	NP-10
	30	Cemented---------	---	---	---	---	---	---	---	---	---
59, 60, 61-------- Schnorbush	0-4	Loam-------------	CL	A-6	0-5	95-100	85-100	70-90	55-80	25-35	10-15
	4-28	Loam, gravelly silty clay loam, clay loam.	CL	A-6	0-10	85-100	70-100	60-90	50-80	30-40	10-20
	28-60	Loam, silt loam, silty clay loam.	CL	A-6	0	100	100	70-100	60-90	30-40	10-20
62*:											
Schnorbush-------	0-4	Loam-------------	CL	A-6	0-5	95-100	85-100	70-90	55-80	25-35	10-15
	4-28	Loam, gravelly silty clay loam, clay loam.	CL	A-6	0-10	85-100	70-100	60-90	50-80	30-40	10-20
	28-60	Loam, silt loam, silty clay loam.	CL	A-6	0	100	100	70-100	60-90	30-40	10-20
Casey------------	0-8	Silty clay loam	CL	A-6, A-7	0	95-100	85-100	80-100	75-95	35-45	15-20
	8-36	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	95-100	85-100	80-100	75-95	40-60	15-30
	36-60	Stratified clay to loamy fine sand.	CL, CH	A-7	0	95-100	85-100	80-100	65-95	40-60	15-30
63---------------- Sequim	0-10	Very gravelly sandy loam.	GM, SM	A-1	10-15	50-65	40-55	25-40	10-25	---	NP
	10-23	Very gravelly loamy sand, very cobbly loamy sand, extremely cobbly loamy sand.	GP-GM, GM, SP-SM, SM	A-1	15-45	45-65	25-55	20-40	5-20	---	NP
	23-60	Very gravelly loamy sand, very gravelly sand, extremely cobbly sand.	GP, GP-GM, SP, SP-SM	A-1	20-45	45-60	20-50	15-35	0-10	---	NP
64*:											
Sequim-----------	0-10	Very gravelly sandy loam.	GM, SM	A-1	10-15	50-65	40-55	25-40	10-25	---	NP
	10-23	Very gravelly loamy sand, very cobbly loamy sand, extremely cobbly loamy sand.	GP-GM, GM, SP-SM, SM	A-1	15-45	45-65	25-55	20-40	5-20	---	NP
	23-60	Very gravelly loamy sand, very gravelly sand, extremely cobbly sand.	GP, GP-GM, SP, SP-SM	A-1	20-45	45-60	20-50	15-35	0-10	---	NP

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
64*:											
McKenna	0-8	Gravelly silt loam.	ML, GM	A-4	0-5	60-80	55-75	55-65	40-60	20-40	NP-10
	8-18	Gravelly silt loam, gravelly clay loam, gravelly loam.	GM-GC, GC, CL-ML, CL	A-4, A-6	0-5	65-90	55-75	45-65	40-60	25-40	5-15
	18-24	Very gravelly silt loam, very gravelly clay loam, very gravelly loam.	GM-GC, GC	A-2, A-4, A-6, A-7	0-5	30-60	25-50	20-50	20-45	25-45	5-20
	24-32	Very gravelly sandy loam.	GM-GC, GM	A-1, A-2	0-5	30-50	25-40	20-30	10-25	20-30	NP-10
	32	Cemented	---	---	---	---	---	---	---	---	---
Mukilteo	0-10	Muck	PT, OH	A-8	0	---	---	---	---	---	---
	10-60	Hemic material	PT	A-8	0	---	---	---	---	---	---
65 Snahopish	0-10	Very gravelly loam.	GM, SM	A-2, A-1, A-4, A-5	10-25	50-70	40-55	30-50	20-40	30-50	NP-10
	10-41	Extremely gravelly loam, very cobbly loam, very cobbly silt loam.	GM	A-2, A-4	25-35	50-75	25-65	25-60	25-50	25-40	NP-10
	41-60	Very gravelly loam, extremely cobbly loam, extremely cobbly silt loam.	GM	A-2, A-1, A-4	30-45	50-75	20-70	20-60	20-50	25-40	NP-10
66 Solduc	0-7	Very gravelly sandy loam.	GM, SM	A-2, A-1	5-25	50-65	40-50	25-40	15-25	50-70	NP-15
	7-30	Very gravelly sandy loam, very gravelly loam, extremely gravelly sandy loam.	GP-GM, GM	A-1, A-2	10-30	30-50	25-45	15-35	5-20	50-65	NP-15
	30-60	Extremely gravelly loamy sand, extremely gravelly sand, extremely cobbly sand.	GP	A-1	35-45	30-50	20-35	5-25	0-5	---	NP
67, 68 Solleks	0-10	Very gravelly loam.	GM	A-2, A-5, A-7	15-30	55-65	35-50	30-50	25-45	40-60	5-20
	10-33	Very gravelly loam, very cobbly loam, extremely cobbly loam.	GM, GM-GC	A-2, A-4	25-55	40-60	25-45	20-45	20-45	25-35	5-10
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
69 Tealwhit	0-6	Silt loam	CL	A-6	0	100	100	85-100	75-90	25-35	10-15
	6-38	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	20-30
	38-60	Very fine sandy loam, silty clay, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	90-100	60-80	20-40	5-20

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
70, 71----------- Terbies	0-3	Very gravelly sandy loam.	GM	A-1, A-2	5-25	45-55	25-45	25-40	15-30	15-25	NP-5
	3-33	Very gravelly sandy loam, extremely gravelly sandy loam, extremely channery sandy loam.	GM, SM	A-1	15-35	35-65	15-35	15-30	15-20	15-25	NP-5
	33-45	Extremely gravelly sandy loam, extremely channery sandy loam, extremely channery loam.	GM, SM	A-1	20-35	35-60	20-35	20-30	10-20	15-25	NP-5
	45	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
72*:											
Terbies---------	0-3	Very gravelly sandy loam.	GM	A-1, A-2	5-25	45-55	25-45	25-40	15-30	15-25	NP-5
	3-33	Very gravelly sandy loam, extremely gravelly sandy loam, extremely channery sandy loam.	GM, SM	A-1	15-35	35-65	15-35	15-30	15-20	15-25	NP-5
	33-45	Extremely gravelly sandy loam, extremely channery sandy loam, extremely channery loam.	GM, SM	A-1	20-35	35-60	20-35	20-30	10-20	15-25	NP-5
	45	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
73--------------- Typic Xerofluvents	0-6	Very fine sandy loam.	SM, ML	A-4	0	95-100	90-100	75-95	40-55	---	NP
	6-30	Stratified sand to gravelly sand.	SP-SM	A-1, A-2, A-3	0	65-100	55-100	30-70	5-10	---	NP
	30-60	Extremely cobbly sand, extremely gravelly sand, very gravelly sand.	GP, GP-GM, SP, SP-SM	A-1	20-50	30-60	20-55	10-35	0-5	---	NP
74--------------- Wellman	0-21	Gravelly silt loam.	ML, OL, MH, OH	A-5, A-7	0	70-90	60-75	55-75	50-70	40-60	5-20
	21-30	Extremely gravelly sandy loam, extremely gravelly loam.	GP-GM, GM	A-2, A-1	5-20	25-35	10-25	10-25	5-20	30-40	NP-10
	30-60	Extremely gravelly sand, extremely gravelly loamy sand.	GP	A-1	5-20	25-35	15-25	5-20	0-5	---	NP

See footnote at end of table.

TABLE 13.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
75, 76------------ Yeary	0-7	Gravelly loam----	SC, CL	A-6	0	90-95	60-75	50-70	40-60	25-35	10-15
	7-38	Clay loam, gravelly clay loam, gravelly loam.	SC, CL, GC	A-6	0-10	65-85	60-85	55-65	40-60	25-40	10-20
	38	Cemented---------	---	---	---	---	---	---	---	---	---
77---------------- Zeeka	0-6	Silt loam	ML	A-4, A-5, A-6, A-7	0	100	90-100	85-95	80-90	30-45	5-15
	6-26	Silt loam, gravelly silt loam.	ML	A-4, A-5, A-6, A-7	0-10	80-95	65-90	60-85	55-80	30-45	5-15
	26	Cemented---------	---	---	---	---	---	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	In/hr	In/in	pH				Pct
1---------------- Agnew	0-8	15-25	0.2-0.6	0.18-0.21	5.6-6.5	Low------------	0.37	5	3-5
	8-46	20-35	0.2-0.6	0.17-0.20	5.6-6.5	Moderate--------	0.32		
	46-60	15-30	0.06-0.2	0.17-0.20	5.6-7.3	Low------------	0.32		
2---------------- Andeptic Udorthents	0-7	---	0.6-2.0	0.15-0.18	4.5-5.5	Low------------	0.20	3	5-10
	7-60	---	2.0-6.0	0.06-0.09	4.5-6.0	Low------------	0.15		
3*. Beaches									
4---------------- Bellingham	0-9	27-40	0.06-0.2	0.20-0.24	5.6-6.5	High-----------	0.32	5	10-15
	9-60	35-60	0.06-0.2	0.20-0.24	6.1-7.3	High-----------	0.24		
5---------------- Calawah	0-10	---	0.6-2.0	0.18-0.21	4.5-5.5	Low------------	0.28	5	10-15
	10-46	---	0.6-2.0	0.18-0.21	4.5-5.5	Low------------	0.28		
	46-60	---	0.6-2.0	0.11-0.15	4.5-5.5	Low------------	0.24		
6---------------- Carlsborg	0-9	2-5	2.0-6.0	0.08-0.10	6.1-6.5	Low------------	0.15	2	1-4
	9-20	2-4	6.0-20	0.02-0.04	6.1-6.5	Low------------	0.10		
	20-60	0-3	6.0-20	0.01-0.03	6.1-7.3	Low------------	0.05		
7*:									
Carlsborg--------	0-9	2-5	2.0-6.0	0.08-0.10	6.1-6.5	Low------------	0.15	2	1-4
	9-20	2-4	6.0-20	0.02-0.04	6.1-6.5	Low------------	0.10		
	20-60	0-3	6.0-20	0.01-0.03	6.1-7.3	Low------------	0.05		
Dungeness--------	0-8	5-15	0.6-2.0	0.18-0.20	6.1-7.3	Low------------	0.43	5	2-5
	8-42	5-15	0.6-2.0	0.15-0.17	6.1-7.3	Low------------	0.37		
	42-60	0-10	0.6-2.0	0.06-0.10	6.6-7.3	Low------------	0.24		
8---------------- Casey	0-8	30-40	0.2-0.6	0.14-0.17	5.1-6.5	Moderate--------	0.32	3	5-8
	8-36	35-55	<0.06	0.13-0.17	5.6-7.3	Moderate--------	0.28		
	36-60	35-55	<0.06	0.13-0.17	6.1-7.3	Moderate--------	0.28		
9---------------- Cassolary	0-8	5-10	0.6-2.0	0.12-0.15	5.1-6.5	Low------------	0.24	5	1-3
	8-22	5-10	0.6-2.0	0.13-0.17	5.6-6.5	Low------------	0.37		
	22-60	10-20	0.2-0.6	0.14-0.18	5.6-7.3	Low------------	0.20		
10--------------- Catla	0-3	5-10	0.6-2.0	0.08-0.10	5.1-6.0	Low------------	0.20	1	2-5
	3-14	5-15	0.6-2.0	0.08-0.10	5.1-6.0	Low------------	0.20		
	14	---	---	---	---	---------------	----		
11*:									
Catla------------	0-3	5-10	0.6-2.0	0.08-0.10	5.1-6.0	Low------------	0.20	1	2-5
	3-14	5-15	0.6-2.0	0.08-0.10	5.1-6.0	Low------------	0.20		
	14	---	---	---	---	---------------	----		
Hoypus-----------	0-4	2-5	6.0-20	0.03-0.05	5.1-6.0	Low------------	0.15	3	1-3
	4-15	5-10	6.0-20	0.05-0.08	5.6-6.5	Low------------	0.05		
	15-60	0-3	6.0-20	0.01-0.03	5.6-6.5	Low------------	0.05		
12, 13----------- Clallam	0-10	3-8	0.6-2.0	0.08-0.11	5.1-6.5	Low------------	0.10	2	3-5
	10-28	3-12	0.6-2.0	0.06-0.10	5.1-6.5	Low------------	0.15		
	28	---	---	---	---	---------------	----		
14*:									
Clallam----------	0-10	3-8	0.6-2.0	0.08-0.11	5.1-6.5	Low------------	0.10	2	3-5
	10-28	3-12	0.6-2.0	0.06-0.10	5.1-6.5	Low------------	0.15		
	28	---	---	---	---	---------------	----		

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
14*:									
Hoypus----------	0-3	5-10	6.0-20	0.07-0.10	5.1-6.0	Low------------	0.15	3	1-4
	3-10	5-10	6.0-20	0.05-0.08	5.6-6.5	Low------------	0.05		
	10-31	0-3	6.0-20	0.01-0.03	5.6-6.5	Low------------	0.05		
	31-45	0-3	6.0-20	0.01-0.03	5.6-6.5	Low------------	0.05		
	45-60	0-3	6.0-20	0.05-0.08	5.6-6.5	Low------------	0.05		
15--------------- Clallam Variant	0-7	---	0.6-2.0	0.12-0.15	4.5-5.5	Low------------	0.15	2	1-3
	7-15	---	0.6-2.0	0.10-0.14	5.1-6.0	Low------------	0.15		
	15-30	---	0.6-2.0	0.08-0.12	5.1-6.0	Low------------	0.10		
	30	---	---	---	---	---------------	----		
16--------------- Dick	0-3	0-3	6.0-20	0.06-0.08	5.6-7.3	Low------------	0.24	5	0-1
	3-22	0-3	6.0-20	0.04-0.08	5.6-7.3	Low------------	0.20		
	22-48	2-8	6.0-20	0.04-0.08	6.1-7.3	Low------------	0.17		
	48-60	2-8	6.0-20	0.03-0.07	6.1-7.3	Low------------	0.15		
17--------------- Dungeness	0-8	5-15	0.6-2.0	0.18-0.20	6.1-7.3	Low------------	0.43	5	2-5
	8-42	5-15	0.6-2.0	0.15-0.17	6.1-7.3	Low------------	0.37		
	42-60	0-10	0.6-2.0	0.06-0.10	6.6-7.3	Low------------	0.24		
18--------------- Dystric Xerorthents	0-6	3-10	0.6-2.0	0.03-0.06	5.1-6.0	Low------------	0.05	1	1-4
	6-60	3-10	2.0-6.0	0.02-0.05	5.1-6.0	Low------------	0.02		
19--------------- Dystric Xerorthents	0-3	3-10	0.6-2.0	0.07-0.11	5.1-6.0	Low------------	0.20	3	1-3
	3-60	3-10	2.0-6.0	0.03-0.09	5.1-6.0	Low------------	0.17		
20, 21----------- Elwha	0-4	5-10	0.6-2.0	0.09-0.11	5.1-6.0	Low------------	0.15	2	3-5
	4-33	5-15	0.6-2.0	0.08-0.12	5.1-6.0	Low------------	0.17		
	33	---	---	---	---	---------------	----		
22--------------- Hoh	0-7	3-8	0.6-2.0	0.17-0.20	4.5-5.5	Low------------	0.43	3	1-3
	7-21	0-5	0.6-2.0	0.12-0.16	4.5-5.5	Low------------	0.37		
	21-60	0-5	0.6-2.0	0.03-0.07	4.5-5.5	Low------------	0.10		
23, 24----------- Hoypus	0-3	5-10	6.0-20	0.07-0.10	5.1-6.0	Low------------	0.15	3	1-4
	3-10	5-10	6.0-20	0.05-0.08	5.6-6.5	Low------------	0.05		
	10-31	0-3	6.0-20	0.01-0.03	5.6-6.5	Low------------	0.05		
	31-45	0-3	6.0-20	0.01-0.03	5.6-6.5	Low------------	0.05		
	45-60	0-3	6.0-20	0.05-0.08	5.6-6.5	Low------------	0.05		
25--------------- Hoypus	0-4	2-5	6.0-20	0.03-0.05	5.1-6.0	Low------------	0.15	3	1-3
	4-15	5-10	6.0-20	0.05-0.08	5.6-6.5	Low------------	0.05		
	15-60	0-3	6.0-20	0.01-0.03	5.6-6.5	Low------------	0.05		
26--------------- Hyas	0-13	---	0.6-2.0	0.12-0.14	4.5-5.5	Low------------	0.24	5	2-5
	13-38	---	0.6-2.0	0.10-0.14	5.1-6.0	Low------------	0.24		
	38-60	---	0.6-2.0	0.07-0.11	5.1-6.0	Low------------	0.20		
27--------------- Ilwaco	0-12	---	0.6-2.0	0.22-0.24	4.5-6.0	Low------------	0.28	5	10-15
	12-60	---	0.6-2.0	0.22-0.24	5.1-6.0	Low------------	0.32		
28*:									
Ilwaco-----------	0-12	---	0.6-2.0	0.22-0.24	4.5-6.0	Low------------	0.28	5	10-15
	12-60	---	0.6-2.0	0.22-0.24	5.1-6.0	Low------------	0.32		
Klone-----------	0-10	---	0.6-2.0	0.07-0.10	4.5-5.0	Low------------	0.15	1	10-15
	10-49	---	0.6-2.0	0.06-0.10	4.5-5.5	Low------------	0.15		
	49-60	---	6.0-20	0.01-0.05	5.1-6.0	Low------------	0.05		
29, 30----------- Klone	0-10	---	0.6-2.0	0.07-0.10	4.5-5.0	Low------------	0.15	1	10-15
	10-49	---	0.6-2.0	0.06-0.10	4.5-5.5	Low------------	0.15		
	49-60	---	6.0-20	0.01-0.05	5.1-6.0	Low------------	0.05		

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	In/hr	In/in	pH				Pct
31*:									
Klone	0-10	---	0.6-2.0	0.07-0.10	4.5-5.0	Low	0.15	1	10-15
	10-49	---	0.6-2.0	0.06-0.10	4.5-5.5	Low	0.15		
	49-60	---	6.0-20	0.01-0.05	5.1-6.0	Low	0.05		
Ozette	0-18	---	0.6-2.0	0.18-0.21	4.5-5.5	Moderate	0.32	3	5-15
	18-42	---	0.6-2.0	0.12-0.16	4.5-6.0	Moderate	0.28		
	42	---	---	---	---	---	---		
Tealwhit	0-6	20-27	0.06-0.2	0.18-0.20	4.5-5.5	Moderate	0.43	5	2-10
	6-38	35-50	0.06-0.2	0.14-0.17	4.5-5.5	Moderate	0.28		
	38-60	15-40	0.06-0.2	0.14-0.16	4.5-6.0	Moderate	0.32		
32 Kydaka	0-5	---	0.06-0.2	0.18-0.21	4.5-5.0	Moderate	0.28	2	10-15
	5-11	---	0.06-0.2	0.18-0.21	4.5-5.0	Moderate	0.28		
	11-21	---	0.06-0.2	0.16-0.20	4.5-5.0	Moderate	0.20		
	21-30	---	0.06-0.2	0.08-0.12	4.5-5.0	Low	0.17		
	30	---	---	---	---	---	---		
33*:									
Kydaka	0-5	---	0.06-0.2	0.18-0.21	4.5-5.0	Moderate	0.28	2	10-15
	5-11	---	0.06-0.2	0.18-0.21	4.5-5.0	Moderate	0.28		
	11-21	---	0.06-0.2	0.16-0.20	4.5-5.0	Moderate	0.20		
	21-30	---	0.06-0.2	0.08-0.12	4.5-5.0	Low	0.17		
	30	---	---	---	---	---	---		
Zeeka	0-6	27-35	0.6-2.0	0.16-0.19	3.6-4.4	Moderate	0.32	2	5-10
	6-26	20-35	0.2-0.6	0.13-0.16	3.6-5.0	Moderate	0.32		
	26	---	---	---	---	---	---		
34, 35, 36 Louella	0-11	10-18	0.6-2.0	0.11-0.13	5.6-7.3	Low	0.24	5	3-5
	11-47	20-30	0.6-2.0	0.11-0.14	5.6-7.3	Low	0.20		
	47-60	5-15	0.6-2.0	0.08-0.12	6.1-7.3	Low	0.17		
37 Louella Variant	0-5	18-27	0.6-2.0	0.06-0.10	5.1-6.0	Low	0.15	5	2-5
	5-60	18-35	0.6-2.0	0.04-0.08	5.1-6.0	Low	0.15		
38 Lummi	0-9	20-27	0.6-2.0	0.17-0.20	6.1-7.8	Moderate	0.43	5	5-8
	9-40	18-27	0.6-2.0	0.14-0.16	6.1-7.8	Moderate	0.43		
	40-60	18-27	0.6-2.0	0.14-0.18	6.1-7.8	Moderate	0.43		
39, 40 Lyre	0-5	---	2.0-6.0	0.07-0.10	4.5-6.0	Low	0.10	5	5-10
	5-30	---	2.0-6.0	0.04-0.08	5.1-6.0	Low	0.10		
	30-60	0-2	6.0-20	0.02-0.04	5.6-6.0	Low	0.05		
41 Makah	0-14	---	0.6-2.0	0.12-0.14	4.5-5.5	Low	0.24	5	5-15
	14-45	---	0.6-2.0	0.10-0.14	5.1-6.0	Low	0.24		
	45-60	---	0.6-2.0	0.09-0.12	5.6-6.5	Low	0.17		
42 McKenna	0-8	10-25	0.6-2.0	0.16-0.19	4.5-6.0	Low	0.24	3	3-15
	8-18	20-35	0.06-0.2	0.12-0.16	5.1-6.0	Moderate	0.20		
	18-24	20-35	0.06-0.2	0.12-0.15	5.1-6.0	Moderate	0.15		
	24-32	10-20	0.06-0.2	0.04-0.07	5.6-7.3	Low	0.10		
	32	---	---	---	---	---	---		
43 Mukilteo	0-10	---	0.6-2.0	0.30-0.34	4.5-5.0	Low	0.00	5	20-40
	10-60	---	0.6-2.0	0.30-0.34	4.5-5.5	Low	0.00		
44 Neilton	0-4	0-5	6.0-20	0.04-0.06	5.1-6.0	Low	0.10	2	2-10
	4-23	0-5	>20	0.03-0.05	5.1-6.0	Low	0.05		
	23-60	0-5	>20	0.02-0.04	5.6-7.3	Low	0.05		
45 Neilton	0-6	3-8	6.0-20	0.06-0.09	5.1-6.0	Low	0.10	2	2-10
	6-19	0-5	>20	0.03-0.05	5.1-6.0	Low	0.05		
	19-60	0-5	>20	0.02-0.04	5.6-7.3	Low	0.05		

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	In/hr	In/in	pH				Pct
46 Neilton	0-6	3-8	6.0-20	0.05-0.08	5.1-6.0	Low	0.10	2	2-10
	6-16	0-3	>20	0.01-0.02	5.1-6.0	Low	0.05		
	16-60	0-3	>20	0.01-0.02	5.1-6.5	Low	0.05		
47 Ozette	0-18	---	0.6-2.0	0.18-0.21	4.5-5.5	Moderate	0.32	3	5-15
	18-42	---	0.6-2.0	0.12-0.16	4.5-6.0	Moderate	0.28		
	42	---	---	---	---	---	---		
48*: Ozette	0-18	---	0.6-2.0	0.18-0.21	4.5-5.5	Moderate	0.32	3	5-15
	18-42	---	0.6-2.0	0.12-0.16	4.5-6.0	Moderate	0.28		
	42	---	---	---	---	---	---		
Andeptic Udorthents	0-7	---	0.6-2.0	0.15-0.18	4.5-5.5	Moderate	0.20	3	5-10
	7-60	---	2.0-6.0	0.06-0.09	4.5-6.0	Moderate	0.15		
49, 50, 51 Palix	0-17	---	0.6-2.0	0.20-0.22	3.6-5.0	Low	0.17	4	10-15
	17-44	---	0.6-2.0	0.14-0.17	3.6-5.0	Low	0.15		
	44	---	---	---	---	---	---		
52*. Pits									
53 Puget	0-9	18-27	0.6-2.0	0.19-0.21	5.6-7.3	Moderate	0.28	5	5-10
	9-60	18-35	0.2-0.6	0.19-0.21	4.5-6.5	Moderate	0.32		
54 Queets	0-6	---	0.6-2.0	0.19-0.21	4.5-5.5	Low	0.20	5	2-5
	6-60	---	0.6-2.0	0.08-0.12	4.5-5.5	Low	0.20		
55*: Queets	0-6	---	0.6-2.0	0.19-0.21	4.5-5.5	Low	0.20	5	2-5
	6-60	---	0.6-2.0	0.08-0.12	4.5-5.5	Low	0.20		
Tealwhit	0-6	20-20	0.06-0.2	0.18-0.20	4.5-5.5	Moderate	0.43	5	2-10
	6-38	35-50	0.06-0.2	0.14-0.17	4.5-5.5	Moderate	0.28		
	38-60	15-40	0.06-0.2	0.14-0.16	4.5-6.0	Moderate	0.32		
56 Quillayute	0-20	---	0.6-2.0	0.19-0.21	4.5-5.0	Moderate	0.10	5	15-25
	20-32	---	0.6-2.0	0.17-0.21	4.5-5.0	Moderate	0.15		
	32-60	---	0.6-2.0	0.17-0.21	4.5-5.5	Moderate	0.15		
57*. Riverwash									
58 Sadie	0-4	---	0.6-2.0	0.12-0.15	4.5-5.5	Low	0.24	2	2-4
	4-30	---	0.6-2.0	0.11-0.15	5.1-6.0	Low	0.24		
	30	---	---	---	---	---	---		
59, 60, 61 Schnorbush	0-4	18-27	0.6-2.0	0.12-0.16	5.1-6.0	Low	0.37	5	2-4
	4-28	20-35	0.2-0.6	0.14-0.18	5.1-6.0	Low	0.28		
	28-60	20-35	0.2-0.6	0.15-0.18	5.1-6.0	Low	0.32		
62*: Schnorbush	0-4	18-27	0.6-2.0	0.12-0.16	5.1-6.0	Low	0.37	5	2-4
	4-28	20-35	0.2-0.6	0.14-0.18	5.1-6.0	Low	0.28		
	28-60	20-35	0.2-0.6	0.15-0.18	5.1-6.0	Low	0.32		
Casey	0-8	30-40	0.2-0.6	0.14-0.17	5.1-6.5	Moderate	0.32	3	5-8
	8-36	35-55	<0.06	0.13-0.17	5.6-7.3	Moderate	0.28		
	36-60	35-55	<0.06	0.13-0.17	6.1-7.3	Moderate	0.28		
63 Sequim	0-10	2-5	6.0-20	0.05-0.07	6.1-7.3	Low	0.10	2	2-5
	10-23	2-4	6.0-20	0.02-0.04	6.1-7.3	Low	0.10		
	23-60	0-3	6.0-20	0.01-0.02	6.6-7.3	Low	0.05		

See footnote at end of table.

TABLE 14.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	In/hr	In/in	pH				Pct
64*:									
Sequim----------	0-10	2-5	6.0-20	0.05-0.07	6.1-7.3	Low------------	0.10	2	2-5
	10-23	2-4	6.0-20	0.02-0.04	6.1-7.3	Low------------	0.10		
	23-60	0-3	6.0-20	0.01-0.02	6.6-7.3	Low------------	0.05		
McKenna---------	0-8	10-25	0.6-2.0	0.16-0.19	4.5-6.0	Low------------	0.24	3	3-15
	8-18	20-35	0.06-0.2	0.12-0.16	5.1-6.0	Moderate--------	0.20		
	18-24	20-35	0.06-0.2	0.12-0.15	5.1-6.0	Moderate--------	0.15		
	24-32	10-20	0.06-0.2	0.04-0.07	5.6-7.3	Low------------	0.10		
	32	---	---	---	---	---------------	----		
Mukilteo--------	0-10	---	0.6-2.0	0.30-0.34	4.5-5.0	Low------------	0.00	5	20-40
	10-60	---	0.6-2.0	0.30-0.34	4.5-5.5	Low------------	0.00		
65--------------- Snahopish	0-10	---	0.6-2.0	0.08-0.12	4.5-5.5	Low------------	0.15	5	2-4
	10-41	---	0.6-2.0	0.07-0.13	4.5-5.5	Low------------	0.15		
	41-60	---	0.6-2.0	0.04-0.09	4.5-5.5	Low------------	0.10		
66--------------- Solduc	0-7	---	0.6-2.0	0.07-0.10	4.5-5.5	Low------------	0.10	2	8-15
	7-30	---	0.6-2.0	0.04-0.08	4.5-5.5	Low------------	0.05		
	30-60	0-2	6.0-20	0.01-0.03	4.5-5.5	Low------------	0.02		
67, 68----------- Solleks	0-10	---	0.6-2.0	0.08-0.11	4.5-5.5	Low------------	0.10	2	5-10
	10-33	---	0.6-2.0	0.03-0.07	4.5-5.5	Low------------	0.10		
	33	---	---	---	---	---------------	----		
69--------------- Tealwhit	0-6	20-27	0.06-0.2	0.18-0.20	4.5-5.5	Moderate--------	0.43	5	2-10
	6-38	35-50	0.06-0.2	0.14-0.17	4.5-5.5	Moderate--------	0.28		
	38-60	15-40	0.06-0.2	0.14-0.16	4.5-6.0	Moderate--------	0.32		
70, 71----------- Terbies	0-3	5-15	0.6-2.0	0.05-0.07	5.1-6.5	Low------------	0.10	2	2-10
	3-33	5-15	0.6-2.0	0.04-0.06	5.1-6.0	Low------------	0.05		
	33-45	5-15	0.6-2.0	0.03-0.05	5.1-6.0	Low------------	0.05		
	45	---	---	---	---	---------------	----		
72*:									
Terbies---------	0-3	5-15	0.6-2.0	0.05-0.07	5.1-6.5	Low------------	0.10	2	2-10
	3-33	5-15	0.6-2.0	0.04-0.06	5.1-6.0	Low------------	0.05		
	33-45	5-15	0.6-2.0	0.03-0.05	5.1-6.0	Low------------	0.05		
	45	---	---	---	---	---------------	----		
Rock outcrop.									
73--------------- Typic Xerofluvents	0-6	2-5	2.0-6.0	0.13-0.15	5.6-6.5	Low------------	0.49	2	1-4
	6-30	0-3	6.0-20	0.02-0.04	5.6-6.5	Low------------	0.02		
	30-60	0-3	6.0-20	0.01-0.03	6.1-7.3	Low------------	0.02		
74--------------- Wellman	0-21	---	0.6-2.0	0.13-0.17	4.5-5.5	Low------------	0.24	2	15-20
	21-30	10-15	0.6-2.0	0.03-0.05	4.5-5.5	Low------------	0.05		
	30-60	0-2	6.0-20	0.01-0.02	4.5-5.5	Low------------	0.02		
75, 76----------- Yeary	0-7	18-25	0.6-2.0	0.11-0.13	5.1-6.5	Low------------	0.24	2	3-5
	7-38	22-34	0.2-0.6	0.10-0.14	5.1-6.5	Low------------	0.20		
	38	---	---	---	---	---------------	----		
77--------------- Zeeka	0-6	27-35	0.6-2.0	0.16-0.19	3.6-4.4	Moderate--------	0.32	2	5-10
	6-26	20-35	0.2-0.6	0.13-0.16	3.6-5.0	Moderate--------	0.32		
	26	---	---	---	---	---------------	----		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table**: Depth	High water table**: Kind	High water table**: Months
					Ft		
1 Agnew	C	None	---	---	2.0-4.0	Perched	Jan-Mar
2 Andeptic Udorthents	B	None	---	---	>6.0	---	---
3*. Beaches							
4 Bellingham	D	None	---	---	0-1.0	Perched	Nov-Jun
5 Calawah	B	None	---	---	>6.0	---	---
6 Carlsborg	A	Rare	---	---	>6.0	---	---
7*:							
Carlsborg	A	Rare	---	---	>6.0	---	---
Dungeness	B	Rare	---	---	>6.0	---	---
8 Casey	D	None	---	---	2.0-4.0	Perched	Dec-Apr
9 Cassolary	C	None	---	---	3.0-4.0	Perched	Jan-Mar
10 Catla	D	None	---	---	0.5-1.5	Perched	Jan-May
11*:							
Catla	D	None	---	---	0.5-1.5	Perched	Jan-May
Hoypus	A	None	---	---	>6.0	---	---
12, 13 Clallam	C	None	---	---	1.5-3.0	Perched	Jan-Apr
14*:							
Clallam	C	None	---	---	1.5-3.0	Perched	Jan-Apr
Hoypus	A	None	---	---	>6.0	---	---
15 Clallam Variant	C	None	---	---	2.5-3.5	Perched	Jan-Mar
16 Dick	A	None	---	---	>6.0	---	---
17 Dungeness	B	Rare	---	---	>6.0	---	---
18, 19 Dystric Xerorthents	B	None	---	---	>6.0	---	---
20, 21 Elwha	C	None	---	---	1.5-3.0	Perched	Jan-Apr

See footnotes at end of table.

TABLE 15.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table**		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
22 Hoh	B	Occasional	Brief	Dec-Mar	>6.0	---	---
23, 24, 25 Hoypus	A	None	---	---	>6.0	---	---
26 Hyas	B	None	---	---	>6.0	---	---
27 Ilwaco	B	None	---	---	>6.0	---	---
28*:							
Ilwaco	B	None	---	---	>6.0	---	---
Klone	B	None	---	---	>6.0	---	---
29, 30 Klone	B	None	---	---	>6.0	---	---
31*:							
Klone	B	None	---	---	>6.0	---	---
Ozette	C	None	---	---	3.0-4.0	Perched	Dec-Mar
Tealwhit	D	Rare	---	---	0.5-1.0	Apparent	Oct-May
32 Kydaka	D	None	---	---	0-2.0	Perched	Oct-Jul
33*:							
Kydaka	D	None	---	---	0-2.0	Perched	Oct-Jul
Zeeka	C	None	---	---	1.5-3.0	Perched	Nov-Apr
34, 35, 36 Louella	B	None	---	---	>6.0	---	---
37 Louella Variant	B	None	---	---	>6.0	---	---
38 Lummi	D	Rare	---	---	0.5-2.0	Apparent	Oct-Jun
39, 40 Lyre	B	None	---	---	>6.0	---	---
41 Makah	B	None	---	---	>6.0	---	---
42 McKenna	D	None	---	---	+1-0.5	Perched	Nov-Apr
43 Mukilteo	D	None	---	---	+1-0	Apparent	Oct-May
44, 45, 46 Neilton	A	None	---	---	>6.0	---	---
47 Ozette	C	None	---	---	3.0-4.0	Perched	Dec-Mar
48*:							
Ozette	C	None	---	---	3.0-4.0	Perched	Dec-Mar
Andeptic Udorthents	B	None	---	---	>6.0	---	---

See footnotes at end of table.

TABLE 15.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table**		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
49, 50, 51-------------- Palix	B	None------------	---	---	>6.0	---	---
52*. Pits							
53--------------------- Puget	C	Occasional------	Brief---------	Dec-Mar	4.0-6.0	Apparent	Nov-Apr
54--------------------- Queets	B	Rare------------	---	---	>6.0	---	---
55*:							
Queets-----------------	B	Rare------------	---	---	>6.0	---	---
Tealwhit---------------	D	Rare------------	---	---	0.5-1.0	Apparent	Oct-May
56--------------------- Quillayute	B	None------------	---	---	>6.0	---	---
57*. Riverwash							
58--------------------- Sadie	C	None------------	---	---	2.0-3.0	Perched	Dec-Mar
59, 60, 61-------------- Schnorbush	B	None------------	---	---	>6.0	---	---
62*:							
Schnorbush-------------	B	None------------	---	---	>6.0	---	---
Casey------------------	D	None------------	---	---	2.0-4.0	Perched	Dec-Apr
63--------------------- Sequim	A	None------------	---	---	>6.0	---	---
64*:							
Sequim-----------------	A	None------------	---	---	>6.0	---	---
McKenna----------------	D	None------------	---	---	+1-0.5	Perched	Nov-Apr
Mukilteo---------------	D	None------------	---	---	+1-0	Apparent	Oct-May
65--------------------- Snahopish	B	None------------	---	---	>6.0	---	---
66--------------------- Solduc	B	None------------	---	---	>6.0	---	---
67, 68----------------- Solleks	C	None------------	---	---	>6.0	---	---
69--------------------- Tealwhit	D	Rare------------	---	---	0.5-1.0	Apparent	Oct-May
70, 71----------------- Terbies	B	None------------	---	---	>6.0	---	---
72*:							
Terbies----------------	B	None------------	---	---	>6.0	---	---
Rock outcrop.							
73--------------------- Typic Xerofluvents	A	Occasional------	Brief---------	Dec-Apr	>6.0	---	---

See footnotes at end of table.

TABLE 15.--WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table**		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
74------------------------ Wellman	B	None-------------	---	---	>6.0	---	---
75, 76------------------- Yeary	C	None-------------	---	---	1.5-3.0	Perched	Jan-Apr
77------------------------ Zeeka	C	None-------------	---	---	1.5-3.0	Perched	Nov-Apr

* See description of the map unit for composition and behavior characteristics of the map unit.
** In the "High water table--Depth" column, a plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

TABLE 16.--SOIL FEATURES

[The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
	In		In				
1. Agnew	>60	---	---	---	Low	Moderate	Moderate.
2. Andeptic Udorthents	>60	---	---	---	Low	High	High.
3*. Beaches							
4. Bellingham	>60	---	---	---	---	Moderate	Moderate.
5. Calawah	>60	---	---	---	---	High	High.
6. Carlsborg	>60	---	---	---	Low	Moderate	Moderate.
7*:							
Carlsborg	>60	---	---	---	Low	Moderate	Moderate.
Dungeness	>60	---	---	---	Low	Moderate	Low.
8. Casey	>60	---	---	---	Low	Moderate	Moderate.
9. Cassolary	>60	---	---	---	Low	Moderate	Moderate.
10. Catla	>60	---	10-20	Thin	---	Moderate	Moderate.
11*:							
Catla	>60	---	10-20	Thin	---	Moderate	Moderate.
Hoypus	>60	---	---	---	Low	Moderate	Moderate.
12, 13. Clallam	>60	---	20-40	Thin	Low	Moderate	Moderate.
14*:							
Clallam	>60	---	20-40	Thin	Low	Moderate	Moderate.
Hoypus	>60	---	---	---	Low	Moderate	Moderate.
15. Clallam Variant	>60	---	20-40	Thin	Moderate	Moderate	Moderate.
16. Dick	>60	---	---	---	Low	Moderate	Moderate.
17. Dungeness	>60	---	---	---	Low	Moderate	Low.
18, 19. Dystric Xerorthents	>60	---	---	---	Low	Moderate	Moderate.
20, 21. Elwha	>60	---	20-40	Thin	Low	Moderate	Moderate.
22. Hoh	>60	---	---	---	Low	High	High.

See footnote at end of table.

TABLE 16.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
	In		In				
23, 24, 25 Hoypus	>60	---	---	---	Low	Moderate	Moderate.
26 Hyas	>60	---	---	---	Moderate	High	High.
27 Ilwaco	>60	---	---	---	---	High	High.
28*:							
Ilwaco	>60	---	---	---	---	High	High.
Klone	>60	---	---	---	Low	High	High.
29, 30 Klone	>60	---	---	---	Low	High	High.
31*:							
Klone	>60	---	---	---	Low	High	High.
Ozette	>60	---	40-60	Thin	Low	High	High.
Tealwhit	>60	---	---	---	Low	High	High.
32 Kydaka	>60	---	20-40	Thin	Low	High	High.
33*:							
Kydaka	>60	---	20-40	Thin	Low	High	High.
Zeeka	>60	---	20-40	Thin	---	High	High.
34, 35, 36 Louella	>60	---	---	---	Low	Moderate	Moderate.
37 Louella Variant	>60	---	---	---	Low	Moderate	Moderate.
38 Lummi	>60	---	---	---	Low	Moderate	Low.
39, 40 Lyre	>60	---	---	---	---	High	High.
41 Makah	>60	---	---	---	Low	High	High.
42 McKenna	>60	---	20-40	Thin	Low	High	High.
43 Mukilteo	>60	---	---	---	Low	High	High.
44, 45, 46 Neilton	>60	---	---	---	Low	Moderate	Moderate.
47 Ozette	>60	---	40-60	Thin	Low	High	High.
48*:							
Ozette	>60	---	40-60	Thin	Low	High	High.
Andeptic Udorthents	>60	---	---	---	Low	High	High.
49, 50, 51 Palix	40-60	Soft	---	---	---	High	High.

See footnote at end of table.

TABLE 16.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
	In		In				
52*. Pits							
53. Puget	>60	---	---	---	---	High	High.
54. Queets	>60	---	---	---	Low	High	High.
55*:							
Queets	>60	---	---	---	Low	High	High.
Tealwhit	>60	---	---	---	Low	High	High.
56. Quillayute	>60	---	---	---	Low	High	High.
57*. Riverwash							
58. Sadie	>60	---	25-40	Thin	Low	High	High.
59, 60, 61. Schnorbush	>60	---	---	---	Low	Moderate	Moderate.
62*:							
Schnorbush	>60	---	---	---	Low	Moderate	Moderate.
Casey	>60	---	---	---	Low	Moderate	Moderate.
63. Sequim	>60	---	---	---	Low	Moderate	Low.
64*:							
Sequim	>60	---	---	---	Low	Moderate	Low.
McKenna	>60	---	20-40	Thin	Low	High	High.
Mukilteo	>60	---	---	---	Low	High	High.
65. Snahopish	>60	---	---	---	Low	High	High.
66. Solduc	>60	---	---	---	Low	High	High.
67, 68. Solleks	20-40	Hard	---	---	Low	High	High.
69. Tealwhit	>60	---	---	---	Low	High	High.
70, 71. Terbies	40-60	Hard	---	---	Low	Moderate	Moderate.
72*:							
Terbies	40-60	Hard	---	---	Low	Moderate	Moderate.
Rock outcrop.							
73. Typic Xerofluvents	>60	---	---	---	Low	Moderate	Moderate.
74. Wellman	>60	---	---	---	Low	High	High.

See footnote at end of table.

TABLE 16.--SOIL FEATURES--Continued

Soil name and map symbol	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
	In		In				
75, 76------------------- Yeary	>60	---	20-40	Thin	Low------------	Moderate-------	Moderate.
77---------------------- Zeeka	>60	---	20-40	Thin	---	High-----------	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Agnew	Fine-loamy, mixed, mesic Aquic Haploxeralfs
Andeptic Udorthents	Andeptic Udorthents
Bellingham	Fine, mixed, nonacid, mesic Mollic Haplaquepts
Calawah	Medial, mesic Typic Dystrandepts
Carlsborg	Sandy-skeletal, mixed, mesic Typic Xerorthents
Casey	Fine, mixed, mesic Aquic Haploxeralfs
Cassolary	Coarse-loamy, mixed, mesic Typic Xerochrepts
Catla	Loamy, mixed, mesic, shallow Dystric Xerochrepts
Clallam	Loamy-skeletal, mixed, mesic Dystric Xerochrepts
Clallam Variant	Medial-skeletal, mesic Andic Xerochrepts
Dick	Mixed, mesic Alfic Xeropsamments
Dungeness	Coarse-silty, mixed, nonacid, mesic Mollic Xerofluvents
Dystric Xerorthents	Dystric Xerorthents
Elwha	Coarse-loamy, mixed, mesic Dystric Xerochrepts
Hoh	Coarse-loamy, mixed, acid, mesic Typic Udifluvents
Hoypus	Sandy-skeletal, mixed, mesic Typic Xerorthents
Hyas	Medial, frigid Andic Haplumbrepts
Ilwaco	Medial, mesic Andic Haplumbrepts
Klone	Medial-skeletal, mesic Andic Haplumbrepts
Kydaka	Medial, acid, mesic Typic Humaquepts
Louella	Fine-loamy, mixed, mesic Ultic Haploxerolls
Louella Variant	Loamy-skeletal mixed, mesic Dystric Xerochrepts
Lummi	Fine-silty, mixed, mesic Fluvaquentic Haplaquolls
Lyre	Medial-skeletal, mesic Andic Xerochrepts
Makah	Medial, mesic Andic Haplumbrepts
McKenna	Loamy-skeletal, mixed, nonacid, mesic Mollic Haplaquepts
Mukilteo	Dysic, mesic Typic Medihemists
Neilton	Sandy-skeletal, mixed, mesic Dystric Xerorthents
Ozette	Medial, mesic Andaquic Haplumbrepts
Palix	Medial, mesic Andic Haplumbrepts
Puget	Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents
Queets	Medial, mesic Andic Dystrochrepts
Quillayute	Medial, mesic Typic Dystrandepts
Sadie	Medial, mesic Andic Xerochrepts
Schnorbush	Fine-loamy, mixed, mesic Dystric Xerochrepts
Sequim	Sandy-skeletal, mixed, mesic Entic Haploxerolls
Snahopish	Medial-skeletal, mesic Andic Haplumbrepts
Solduc	Medial-skeletal, mesic Humic Haplorthods
Solleks	Medial-skeletal, mesic Andic Haplumbrepts
Tealwhit	Fine, mixed, acid, mesic Aeric Haplaquepts
Terbies	Loamy-skeletal, mixed, mesic Dystric Xerochrepts
Typic Xerofluvents	Typic Xerofluvents
Wellman	Medial over loamy-skeletal, mixed, mesic Typic Dystrandepts
Yeary	Fine-loamy, mixed, mesic Dystric Xerochrepts
Zeeka	Medial, mesic Aquic Dystrochrepts

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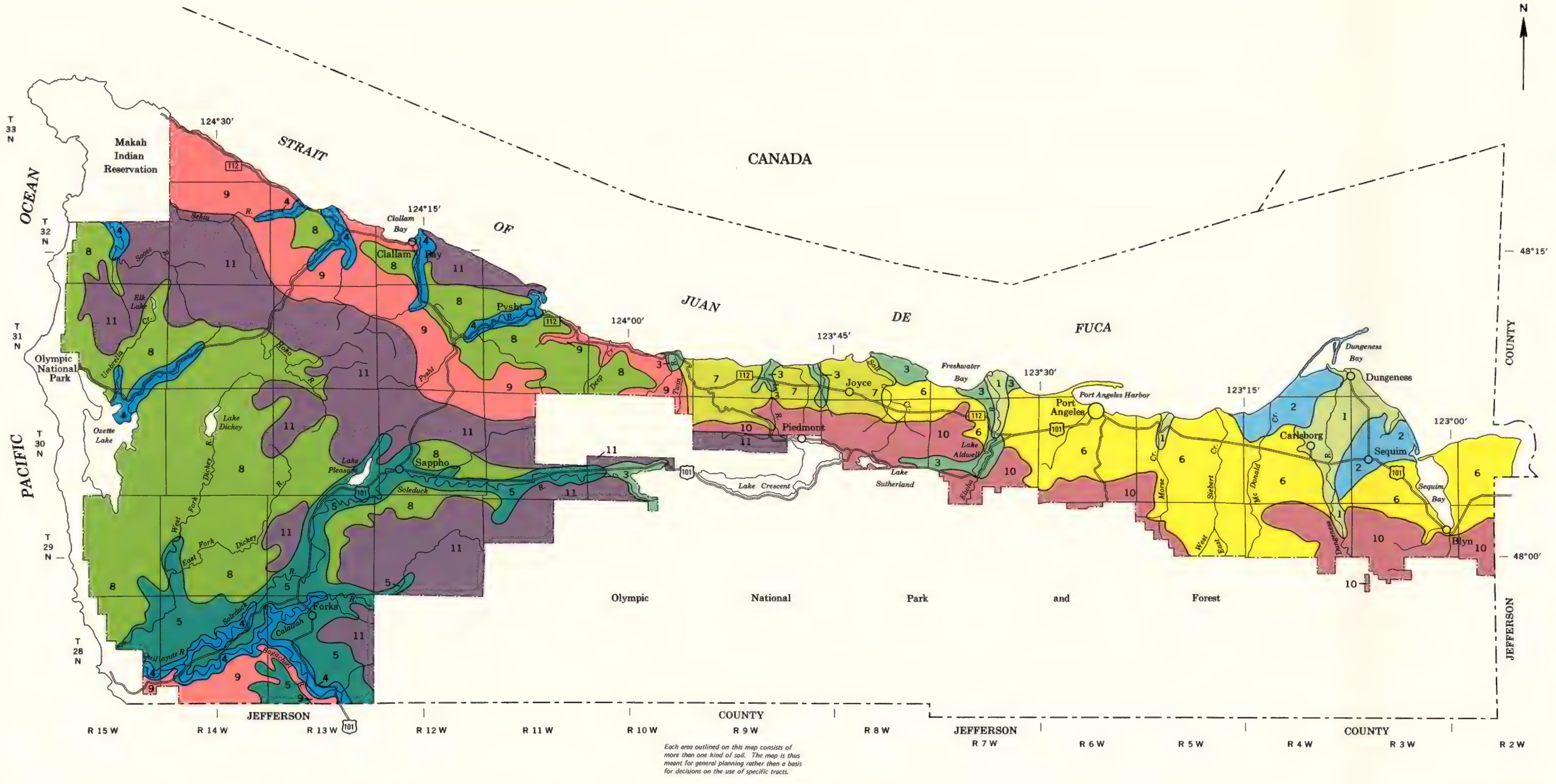


MAP UNITS

SOILS ON TERRACES, TERRACE ESCARPMENTS, FLOOD PLAINS, AND ALLUVIAL FANS

1 Carlsborg-Puget-Dungeness: Very deep, poorly drained, well drained, and somewhat excessively drained, nearly level and gently sloping soils; on terraces, flood plains, and alluvial fans

2 Hoypus-Sequim-Agnew: Very deep, somewhat poorly drained and somewhat excessively drained, nearly level to very steep soils; on terraces, terrace escarpment, and alluvial fans

3 Neilton-Lyre-Casey: Very deep, somewhat poorly drained, somewhat excessively drained, and excessively drained, nearly level to very steep soils; on terraces and terrace escarpments

4 Queets-Tealwhit: Very deep, well drained and poorly drained, nearly level and gently sloping soils; on low terraces and flood plains

5 Solduc-Klone-Calawah: Very deep, well drained and somewhat excessively drained, nearly level to very steep soils; on terraces and terrace escarpments

SOILS ON HILLS

6 Elwha-Clallam-Catla: Shallow and moderately deep, moderately well drained, nearly level to steep soils; on hills

7 Schnorbush-Sadie: Moderately deep and very deep, moderately well drained and well drained, nearly level to extremely steep soils; on hills

8 Ozette-Kydaka: Moderately deep and deep, moderately well drained and poorly drained, nearly level to steep soils; on hills

SOILS ON FOOTHILLS

9 Palix-Ilwaco: Deep and very deep, well drained, moderately steep to extremely steep soils; on foothills

SOILS ON MOUNTAINS

10 Terbies-Louella: Deep and very deep, well drained, moderately steep to extremely steep soils; on mountainsides

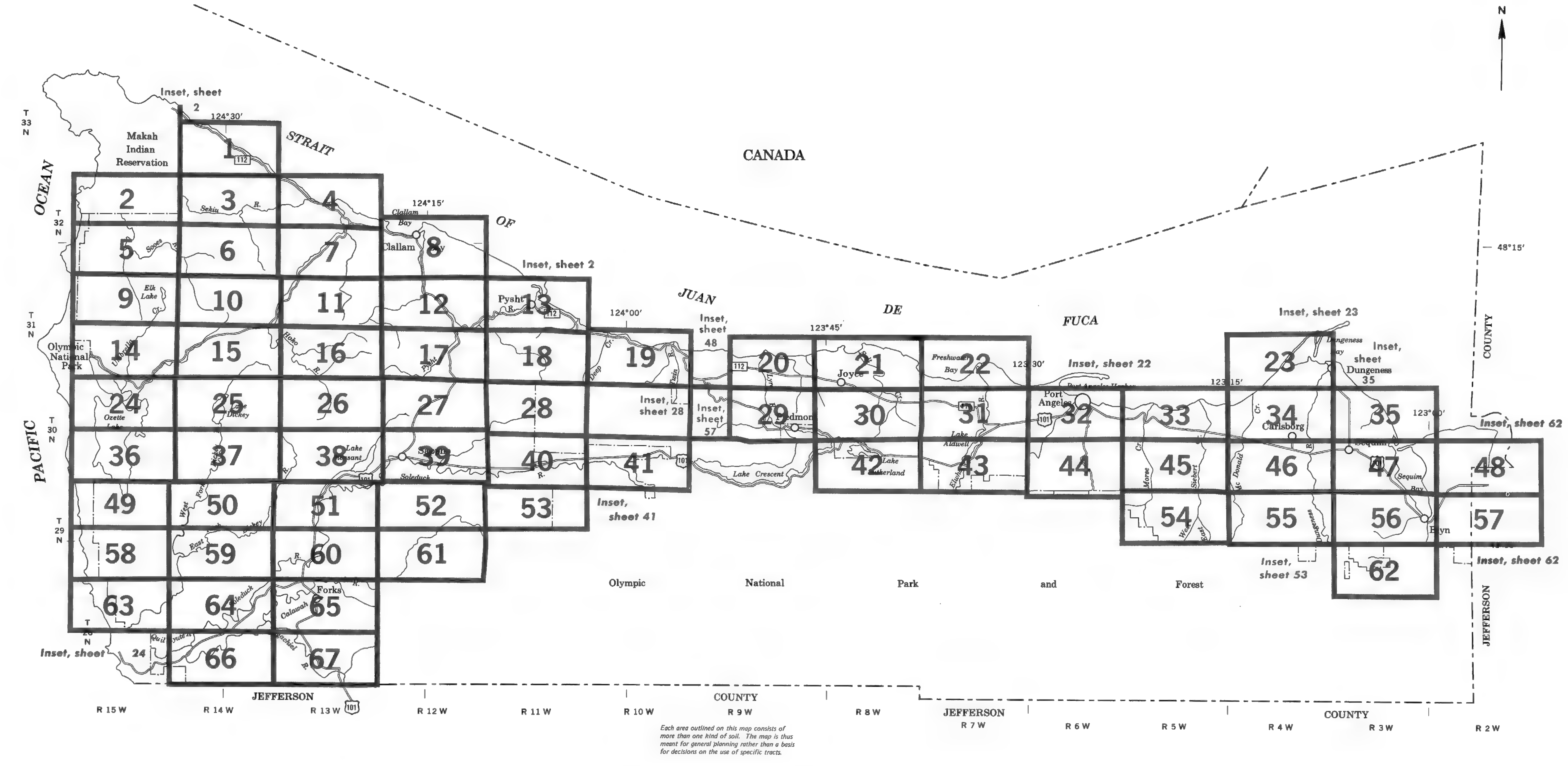
11 Snahopish-Solleks-Makah: Moderately deep and very deep, well drained, steep to extremely steep soils; on mountainsides

Compiled 1979

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES
WASHINGTON STATE UNIVERSITY AGRICULTURE RESEARCH CENTER

GENERAL SOIL MAP
CLALLAM COUNTY AREA, WASHINGTON

Scale 1:316,800
1 0 1 2 3 4 5 Miles
1 0 5 10 Km



Original text from each individual map sheet read:
"This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the State of Washington, Department of Natural Resources from 1972, 1973, and 1975 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned."

CLALLAM COUNTY AREA, WASHINGTON

Scale 1:316,800

1 0 1 2 3 4 5 Miles

1 0 5 10 Km

SOIL LEGEND

SYMBOL	NAME
1	Agnew silt loam, 0 to 8 percent slopes
2	Andeptic Udorthents, very steep*
3	Beaches
4	Bellingham silty clay loam
5	Calawah silt loam, 0 to 15 percent slopes
6	Carlsborg gravelly sandy loam, 0 to 5 percent slopes
7	Carlsborg-Dungeness complex, 0 to 5 percent slopes
8	Casey silty clay loam, 0 to 10 percent slopes
9	Cassolary fine sandy loam, 0 to 8 percent slopes
10	Catla gravelly sandy loam, 2 to 15 percent slopes
11	Catla-Hoypus complex, 2 to 65 percent slopes
12	Clallam gravelly sandy loam, 0 to 15 percent slopes
13	Clallam gravelly sandy loam, 15 to 30 percent slopes
14	Clallam-Hoypus gravelly sandy loams, 0 to 15 percent slopes
15	Clallam Variant gravelly loam, 10 to 30 percent slopes
16	Dick loamy sand, 0 to 15 percent slopes
17	Dungeness silt loam
18	Dystric Xerorthents, bouldery*
19	Dystric Xerorthents, extremely steep*
20	Elwha gravelly sandy loam, 0 to 15 percent slopes
21	Elwha gravelly sandy loam, 15 to 35 percent slopes
22	Hoh silt loam
23	Hoypus gravelly sandy loam, 0 to 15 percent slopes
24	Hoypus gravelly sandy loam, 15 to 30 percent slopes
25	Hoypus gravelly loamy sand, 30 to 65 percent slopes
26	Hyas gravelly loam, 50 to 80 percent slopes
27	Ilwaco silt loam, 15 to 35 percent slopes
28	Ilwaco-Klone complex, 30 to 65 percent slopes
29	Klone very gravelly loam, 0 to 15 percent slopes
30	Klone very gravelly loam, 30 to 65 percent slopes
31	Klone-Ozette-Tealwhit complex, 0 to 15 percent slopes
32	Kydaka silty clay loam
33	Kydaka-Zeeka complex, 0 to 20 percent slopes
34	Louella gravelly loam, 10 to 30 percent slopes
35	Louella gravelly loam, 30 to 65 percent slopes
36	Louella gravelly loam, 65 to 90 percent slopes
37	Louella Variant very gravelly loam, 2 to 15 percent slopes
38	Lummi silt loam
39	Lyre very gravelly sandy loam, 0 to 15 percent slopes
40	Lyre very gravelly sandy loam, 15 to 30 percent slopes
41	Makah gravelly loam, 50 to 80 percent slopes
42	McKenna gravelly silt loam
43	Mukilteo muck
44	Neilton very gravelly loamy sand, 30 to 70 percent slopes
45	Neilton very gravelly sandy loam, 5 to 30 percent slopes
46	Neilton very cobbly sandy loam, 0 to 5 percent slopes
47	Ozette silt loam, 5 to 35 percent slopes
48	Ozette-Andeptic Udorthents complex, 5 to 80 percent slopes
49	Palix loam, 30 to 65 percent slopes
50	Palix loam, 65 to 90 percent slopes
51	Palix loam, cool, 65 to 90 percent slopes
52	Pits
53	Puget silt loam
54	Queets silt loam
55	Queets-Tealwhit silt loams, 0 to 5 percent slopes
56	Quillayute silt loam, 0 to 8 percent slopes
57	Riverwash
58	Sadie gravelly loam, 0 to 35 percent slopes
59	Schnorbush loam, 0 to 20 percent slopes
60	Schnorbush loam, 20 to 55 percent slopes
61	Schnorbush loam, cool, 40 to 80 percent slopes
62	Schnorbush-Casey complex, 0 to 20 percent slopes
63	Sequim very gravelly sandy loam
64	Sequim-McKenna-Mukilteo complex
65	Snahopish very gravelly loam, 35 to 70 percent slopes
66	Solduc very gravelly sandy loam
67	Solleks very gravelly loam, 60 to 90 percent slopes
68	Solleks very gravelly loam, cool, 60 to 90 percent slopes
69	Tealwhit silt loam, 0 to 5 percent slopes
70	Terbies very gravelly sandy loam, 30 to 65 percent slopes
71	Terbies very gravelly sandy loam, 65 to 85 percent slopes
72	Terbies-Rock outcrop complex, 65 to 85 percent slopes
73	Typic Xerofluvents, nearly level*
74	Wellman gravelly silt loam
75	Yeary gravelly loam, 0 to 15 percent slopes
76	Yeary gravelly loam, 15 to 35 percent slopes
77	Zeeka silt loam, 5 to 25 percent slopes

*Broadly defined

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Reservation (national forest or park, state forest or park, and large airport)
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label) Hadley Airstrip

Small airport, airfield, cemetery,

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROAD EMBLEM & DESIGNATIONS

- Federal 101
- State 112

LEVEES

- Without road

DAMS

- Large (to scale)
- Medium or small water w

PITS

- Gravel pit
- Mine or quarry

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end

LAKES, PONDS AND RESERVOIRS

- Perennial water w
- Intermittent int i

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS 21 54

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

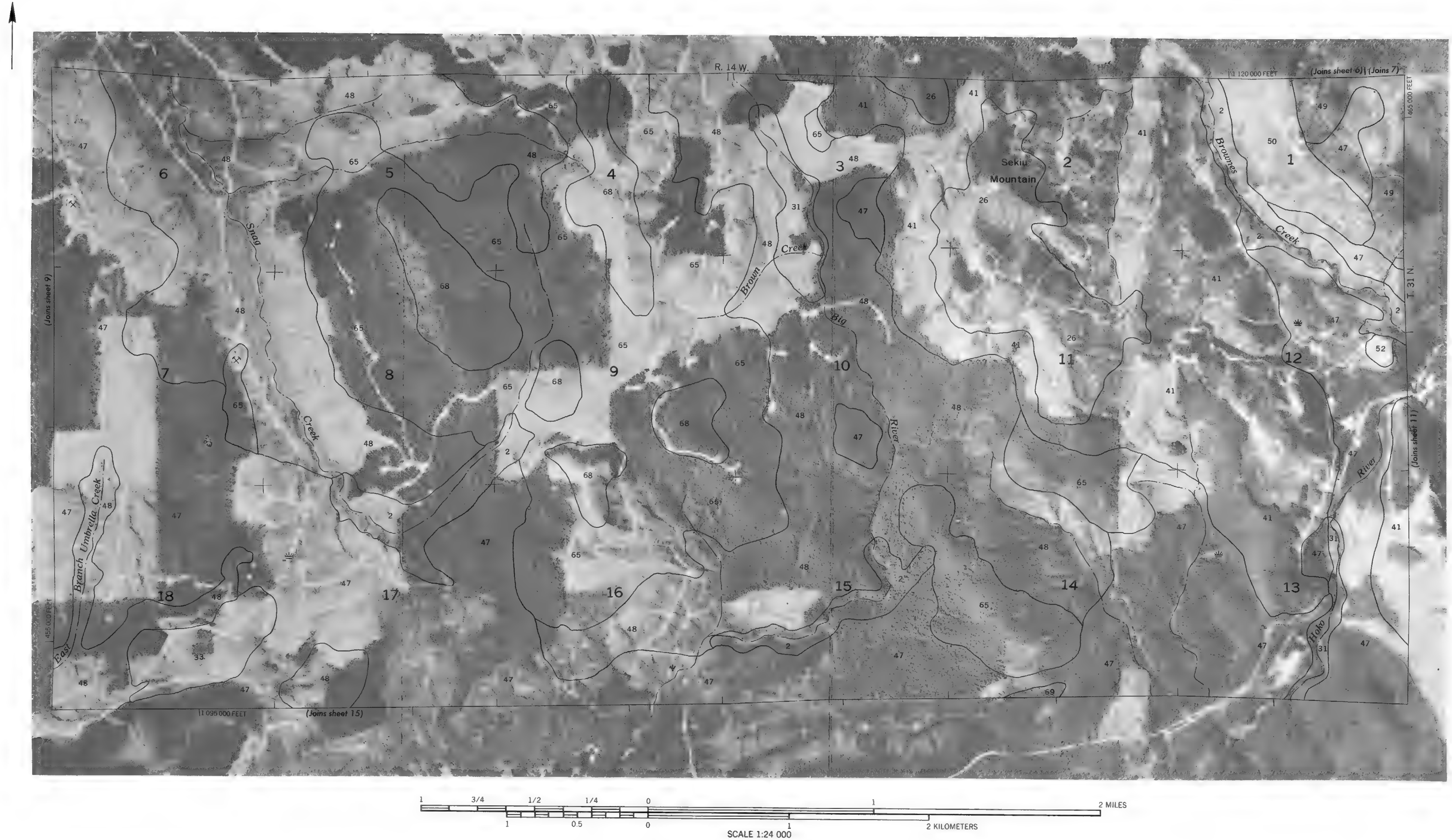
SHORT STEEP SLOPE

DEPRESSION OR SINK

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 10



1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
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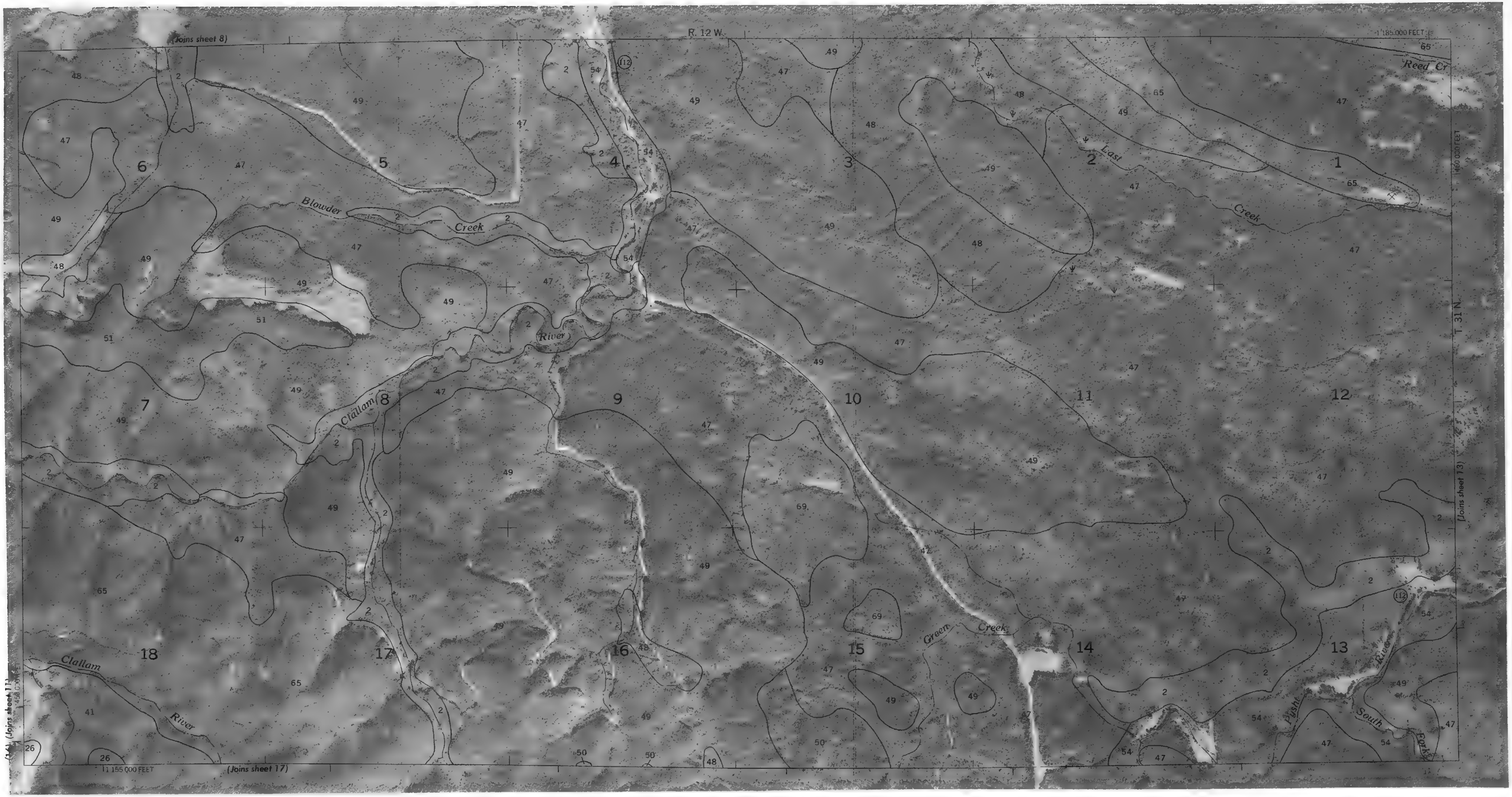
N

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 12



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1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

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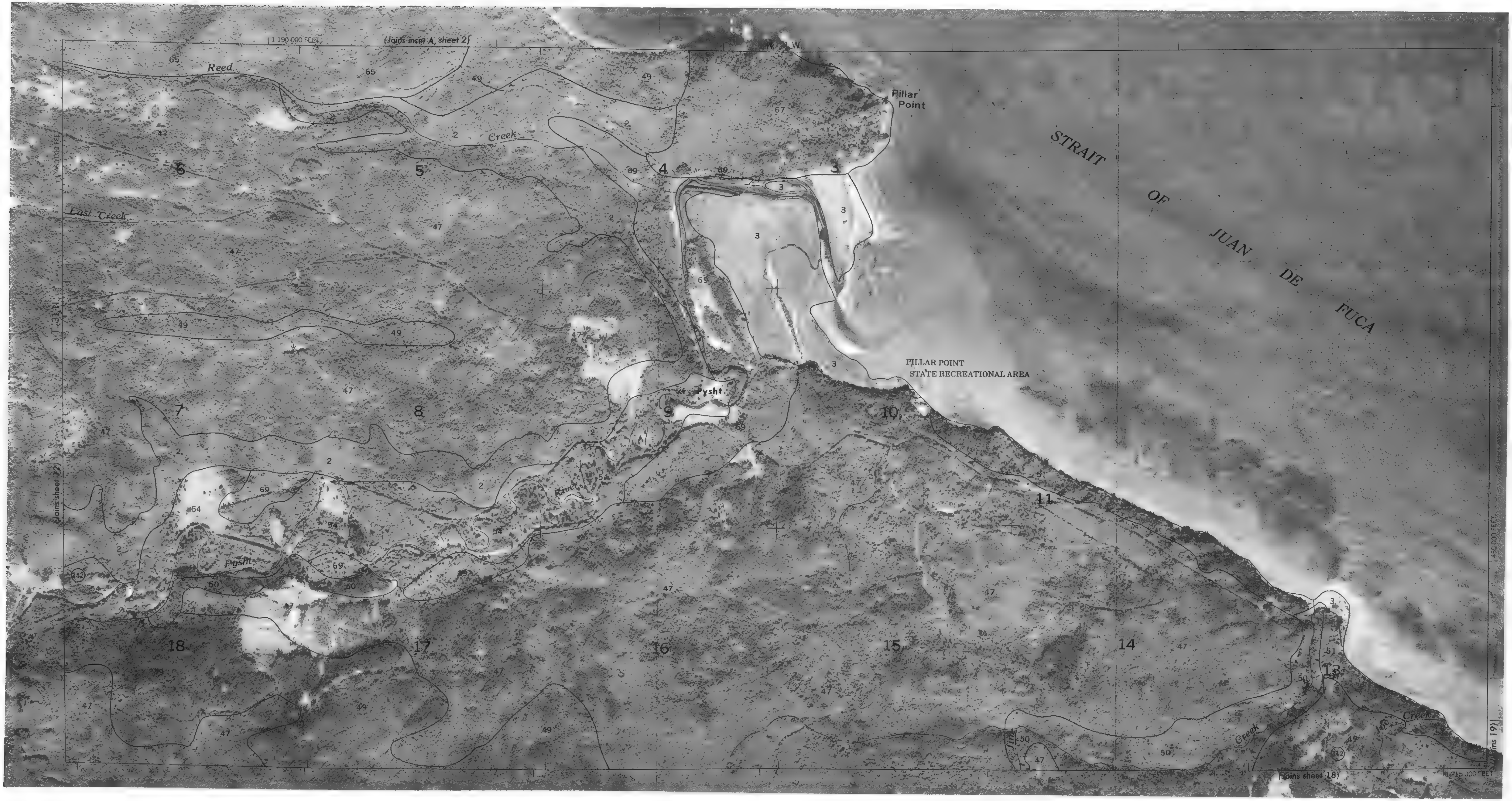

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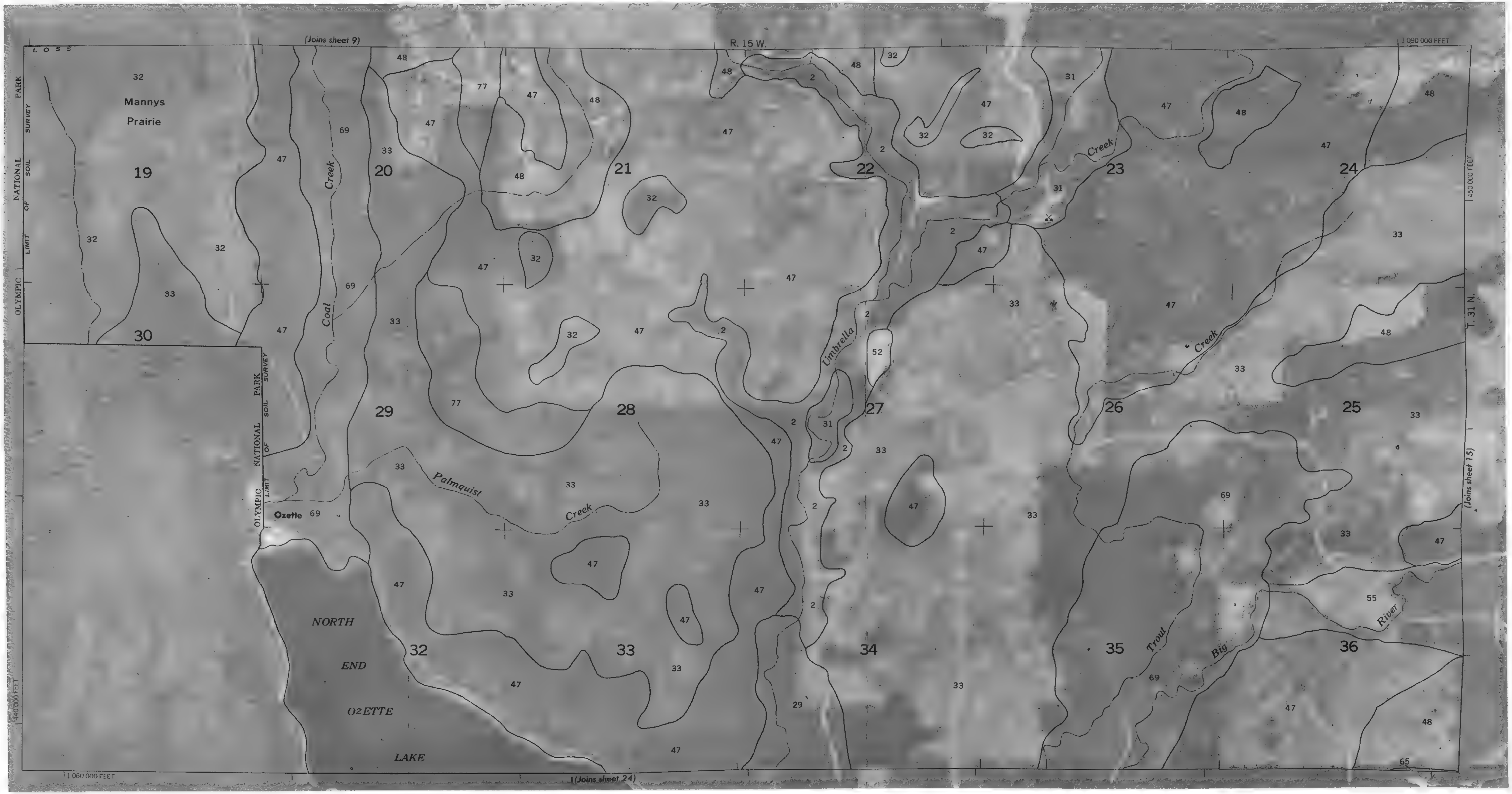
1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

N



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1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

N

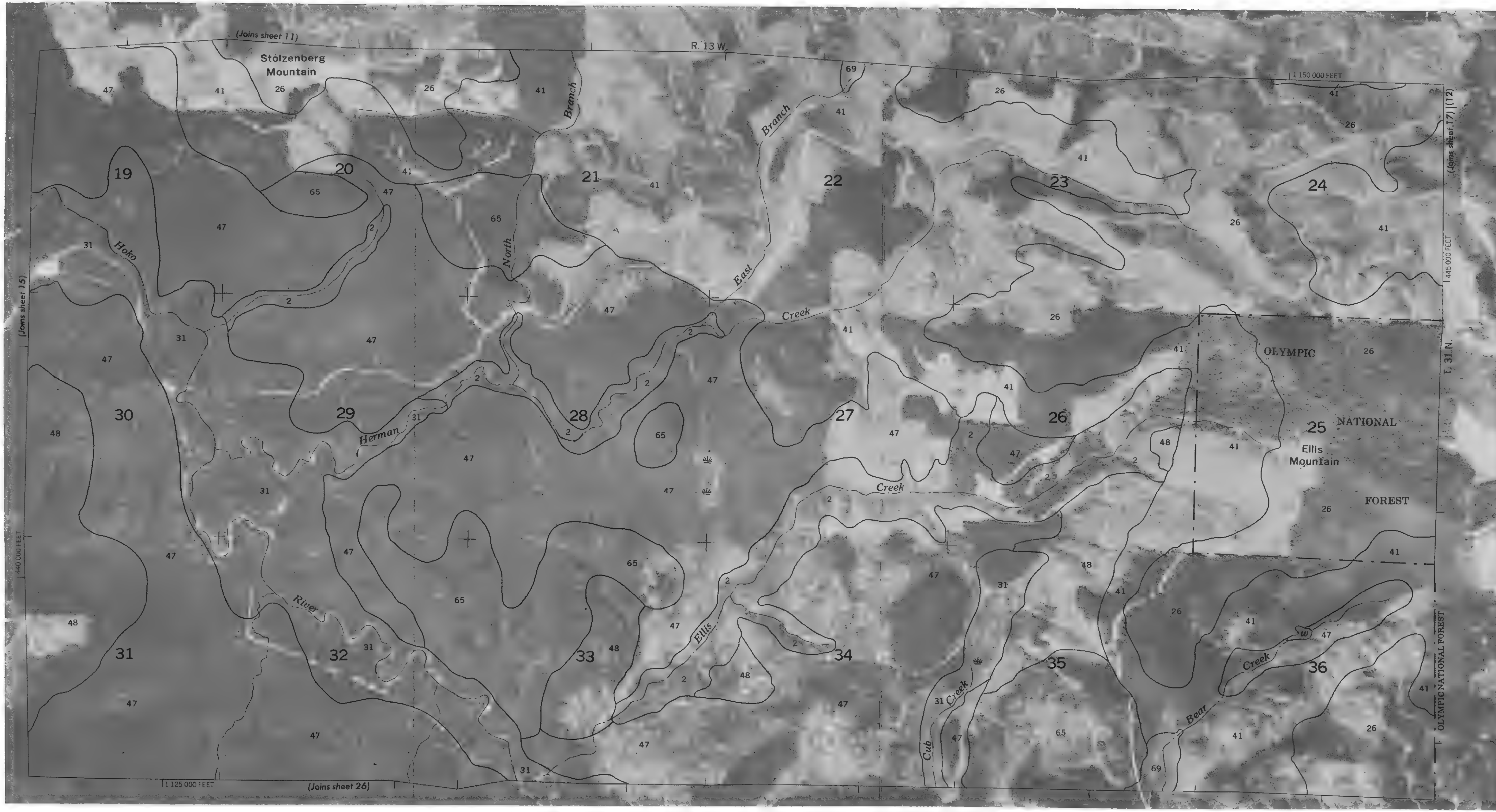
1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

N

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 16



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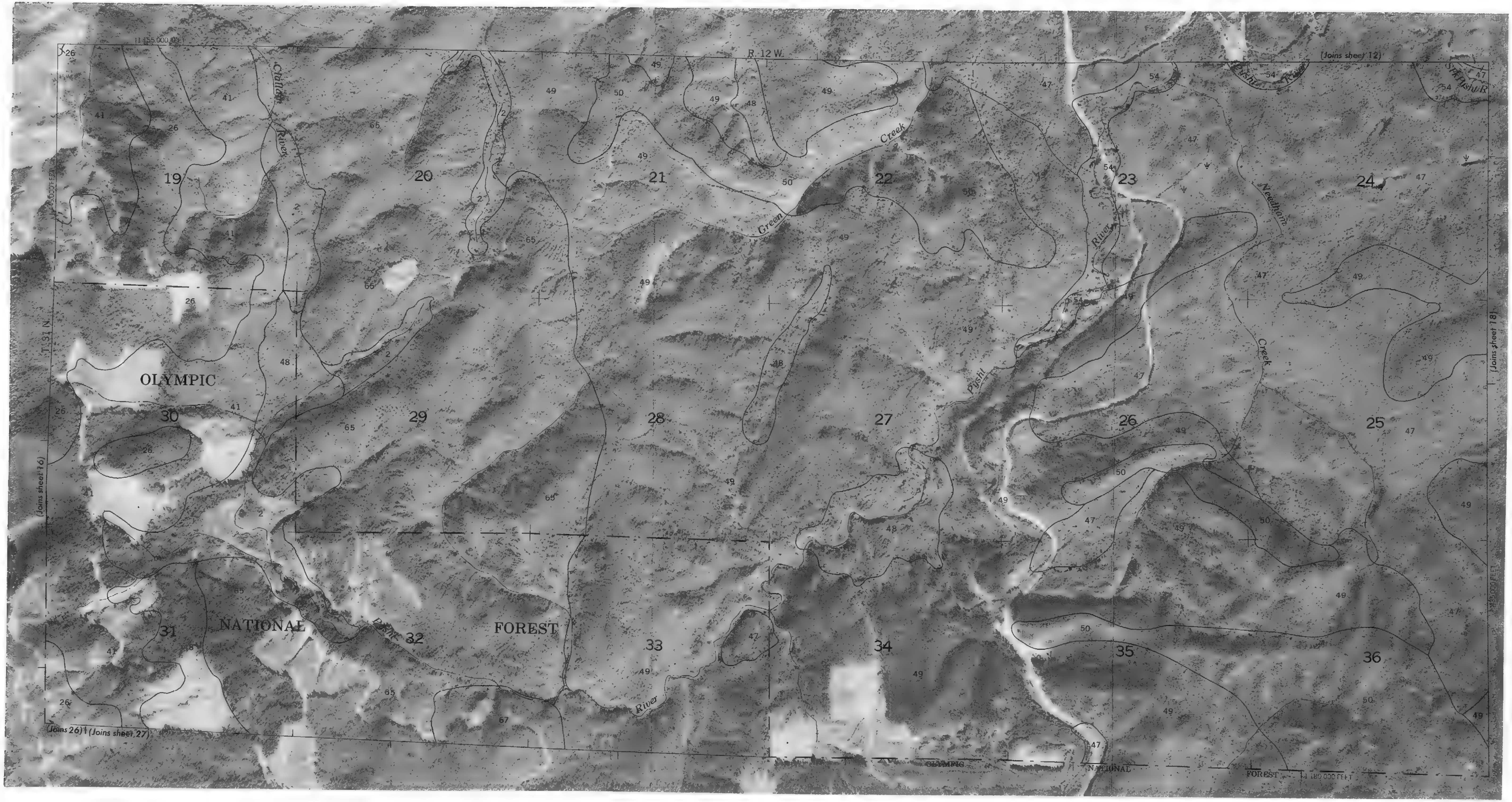
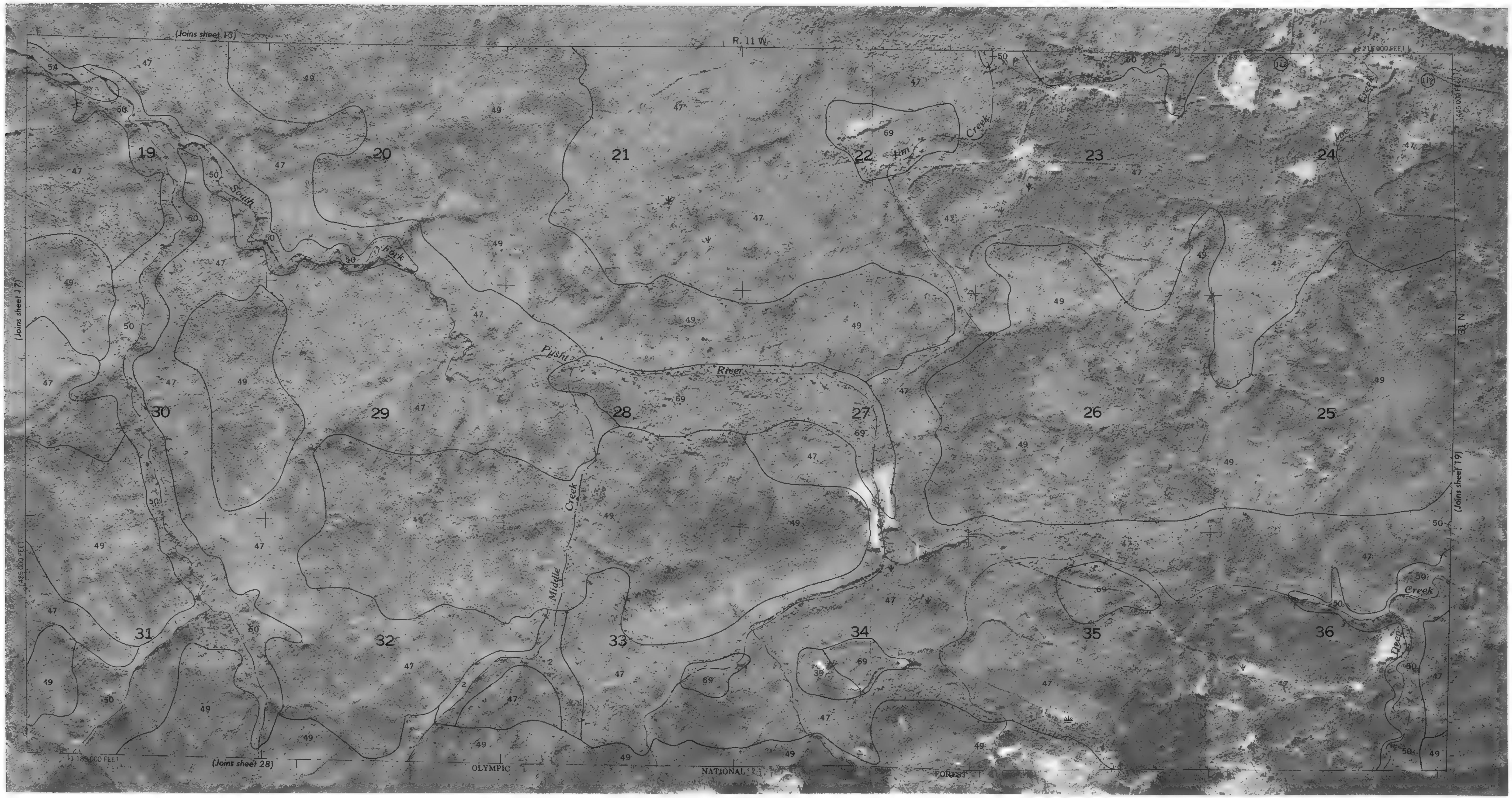


1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

18

N

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 18



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

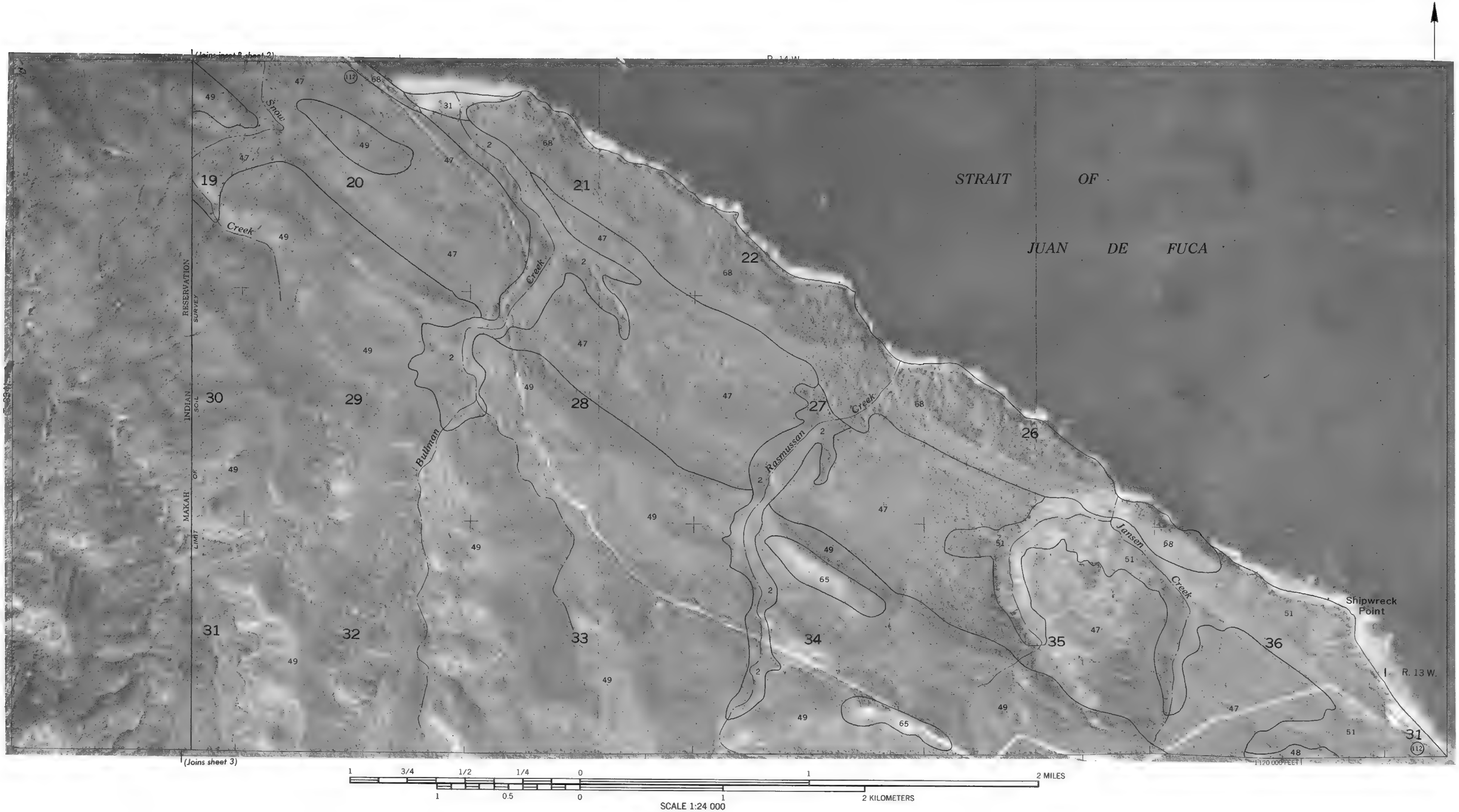
1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 1

1



SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 20

21

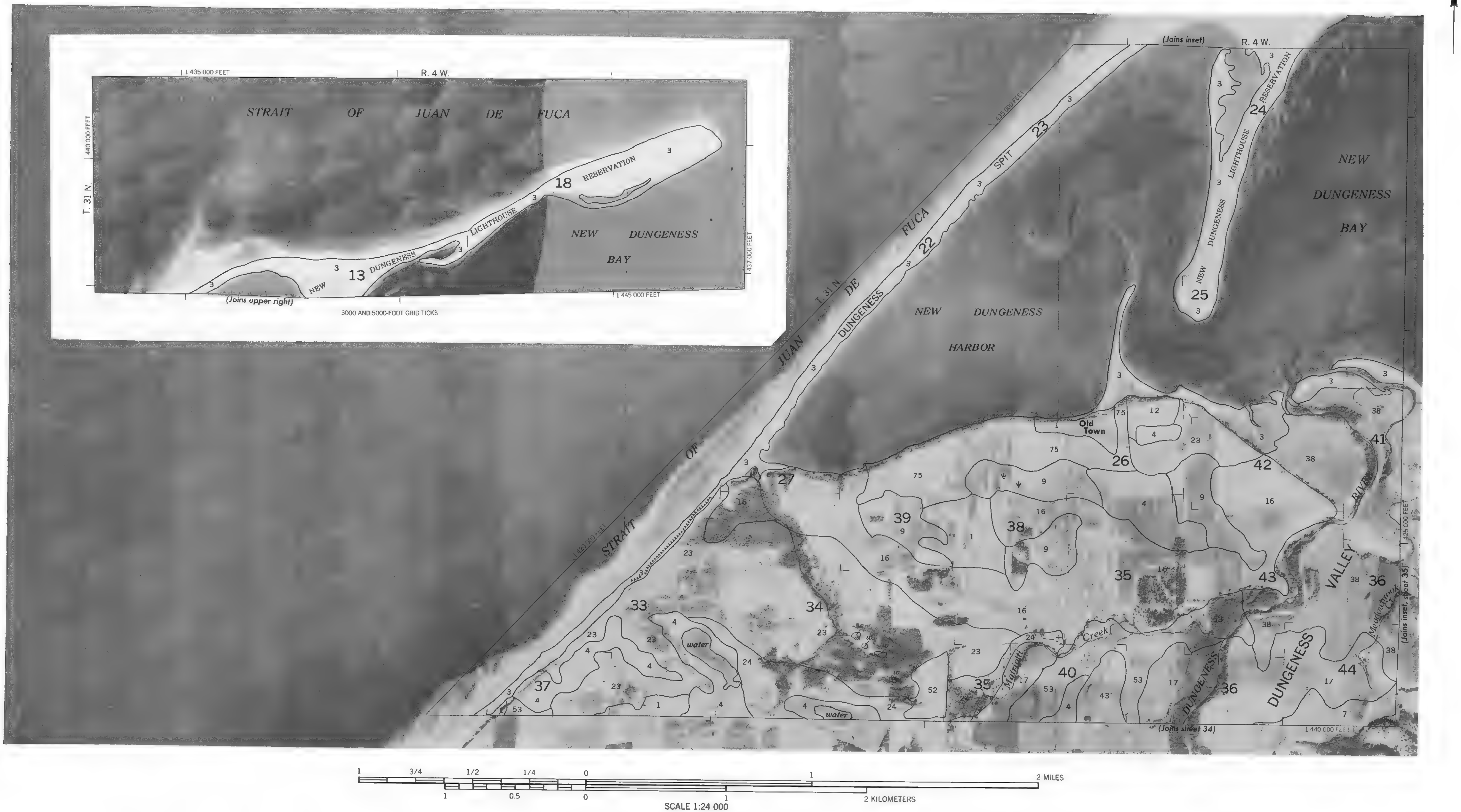
N

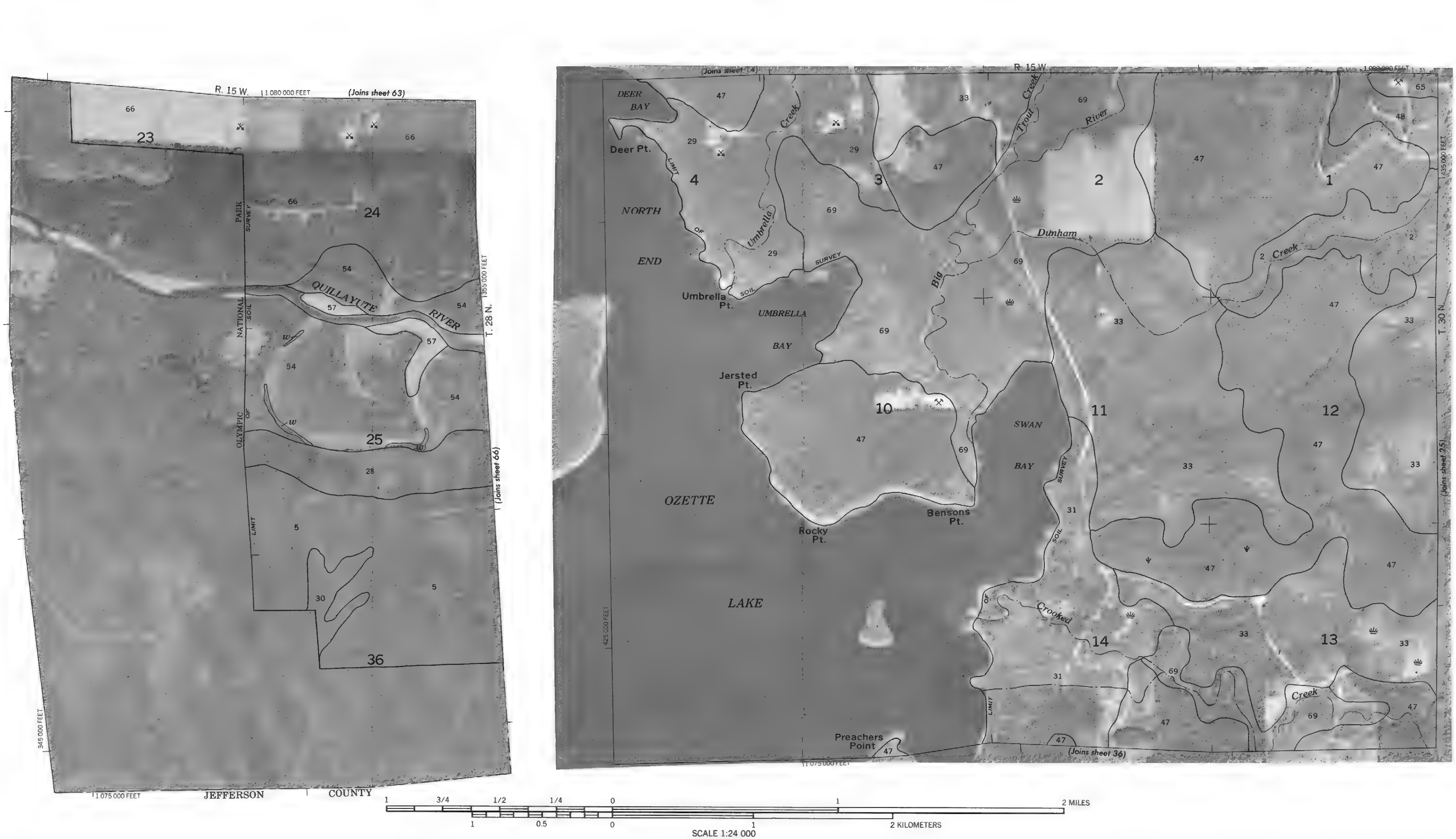
1 3/4 1/2 1/4 0 1 2 MILES

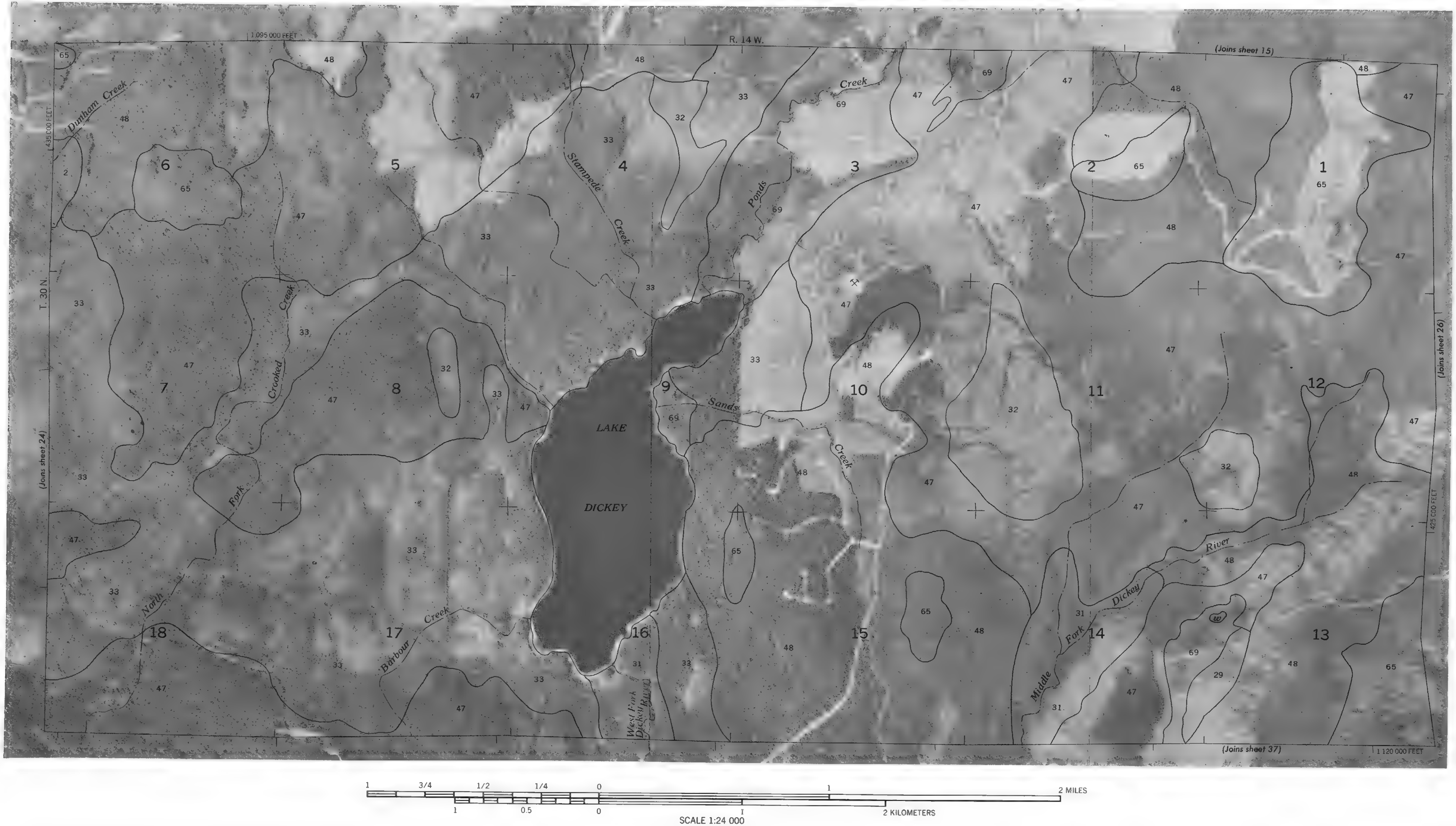
1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

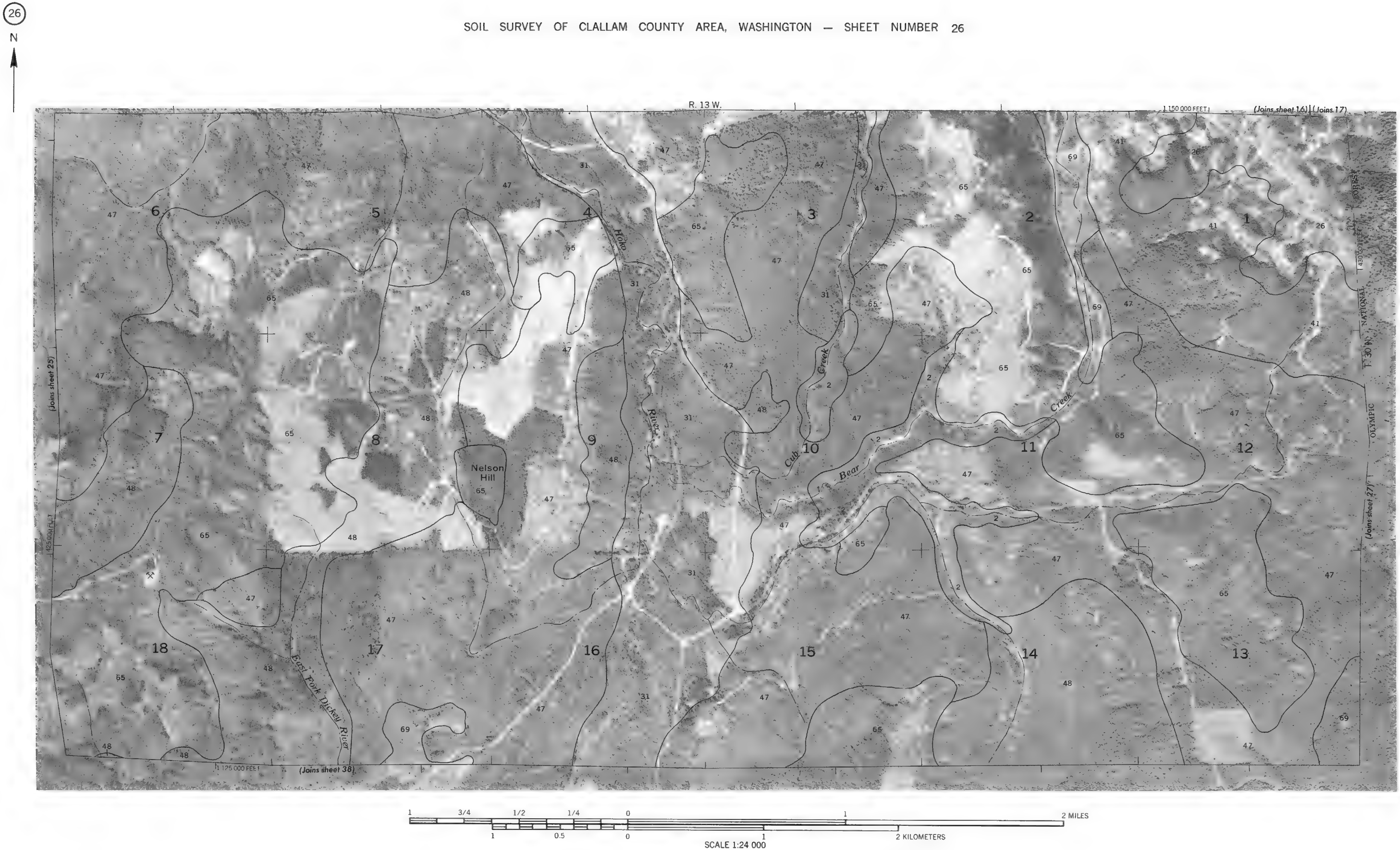

N
R. 7 W.
1 345 000 FEET
R. 6 W.
1 370 000 FEET
STRAIT OF JUAN DE FUCA
EDIZ HOOK
PORT ANGELES HARBOR
PORT ANGELES
428 000 FEET
425 000 FEET
435 000 FEET
T. 31 N.
(Joins lower right)
1 350 000 FEET
(Joins sheet 32)
STRAIT OF JUAN DE FUCA
Angeles Point
FRESHWATER BAY
ELWHA RIVER
Coville Creek
(Joins sheet 21)
1 320 000 FEET
(Joins sheet 31)
Port Angeles
(Joins upper left)
1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

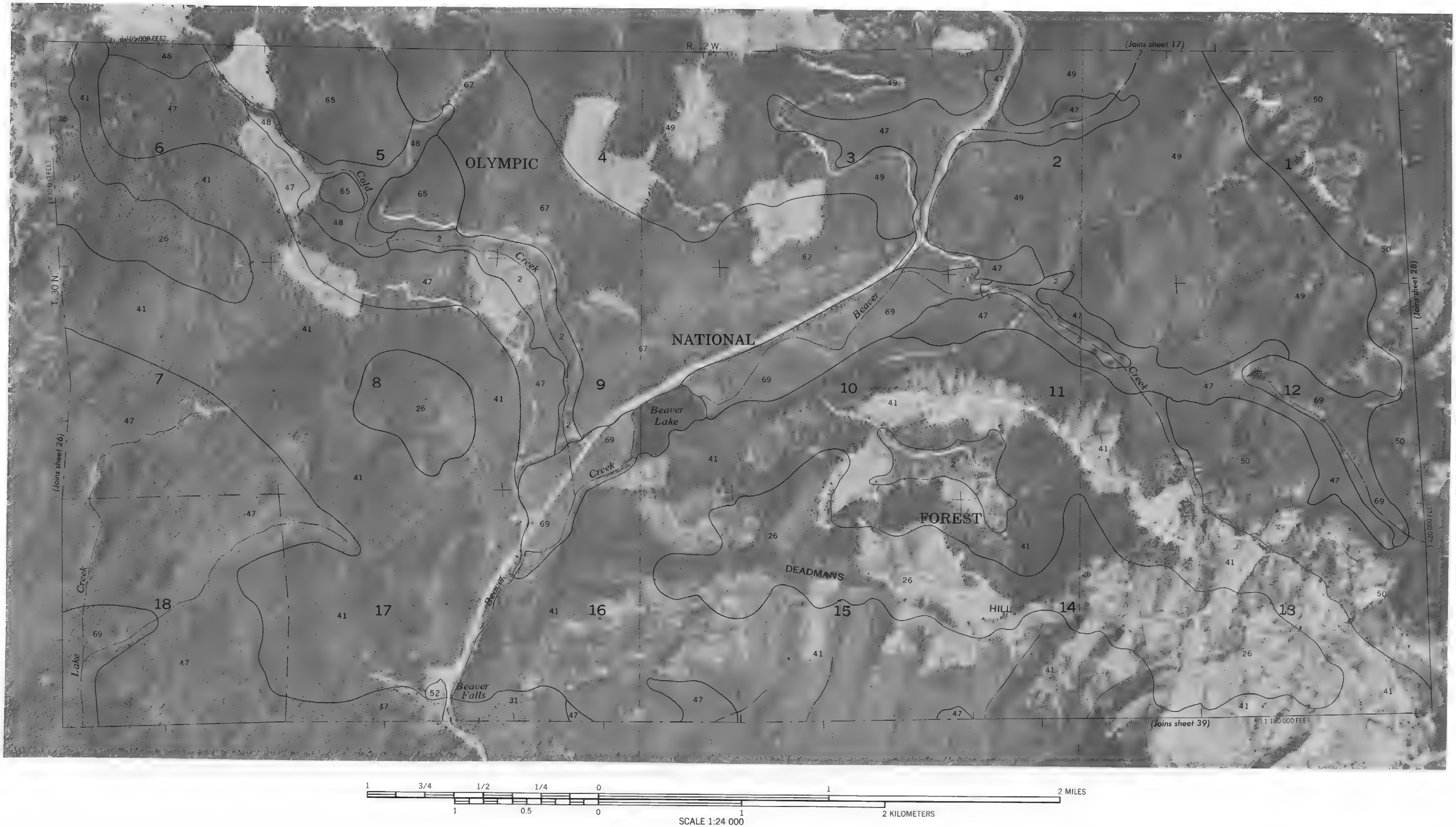

N
STRAIT OF JUAN DE FUCA
NEW DUNGENESS LIGHTHOUSE RESERVATION
NEW DUNGENESS BAY
R. 4 W.
T. 31 N.
1 435 000 FEET
440 000 FEET
437 000 FEET
1 445 000 FEET
(Joins upper right)
3000 AND 5000-FOOT GRID TICKS
(Joins inset)
DUNGENESS SPIT
NEW DUNGENESS HARBOR
Old Town
DUNGENESS RIVER
DUNGENESS VALLEY
Meadowbrook Cr.
Matriotti Creek
water
(Joins inset, sheet 35)
(Joins sheet 34)
420 000 FEET
435 000 FEET
1 440 000 FEET
1
3/4
1/2
1/4
0
1
2 MILES
1
0.5
0
1
2 KILOMETERS
SCALE 1:24 000


N
R. 15 W.
1 080 000 FEET
(Joins sheet 63)
T. 28 N.
355 000 FEET
345 000 FEET
(Joins sheet 66)
1 075 000 FEET
JEFFERSON
COUNTY
QUILLAYUTE
RIVER
OLYMPIC NATIONAL PARK SURVEY
SOIL SURVEY LIMIT
23
24
25
36
(Joins sheet 14)
R. 15 W.
1 090 000 FEET
435 000 FEET
T. 30 N.
(Joins sheet 25)
425 000 FEET
(Joins sheet 36)
1 075 000 FEET
DEER BAY
Deer Pt.
NORTH
END
Umbrella Pt.
UMBRELLA
BAY
Jersted Pt.
OZETTE
LAKE
Rocky Pt.
Bensons Pt.
Preachers Point
SWAN
BAY
Umbrella Creek
Big
Trout Creek
River
Dunham
Creek
Crooked
Creek
LIMIT OF SOIL SURVEY
1
2
3
4
10
11
12
13
14
2 MILES
2 KILOMETERS
SCALE 1:24 000

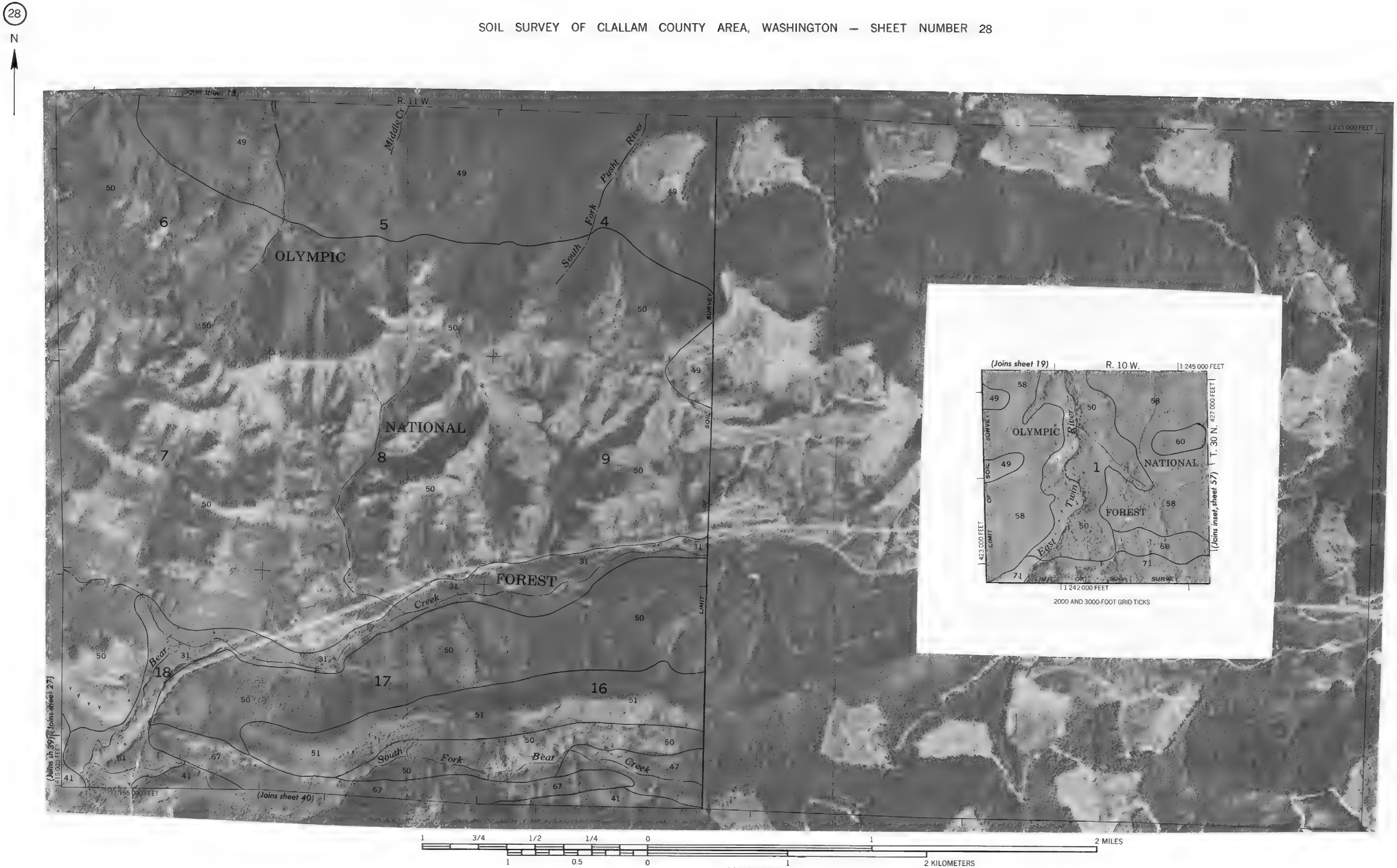

25
N
1 095 000 FEET
R. 14 W.
(Joins sheet 15)
435 000 FEET
T. 30 N.
(Joins sheet 24)
(Joins sheet 26)
425 000 FEET
(Joins sheet 37)
1 120 000 FEET
Dunham Creek
Stampede Creek
Ponds Creek
Crooked Creek
North Fork
Sands Creek
LAKE DICKEY
Barbour Creek
West Fork Dickey River
Middle Fork
Dickey River
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
SCALE 1:24 000
2 MILES
2 KILOMETERS

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 26

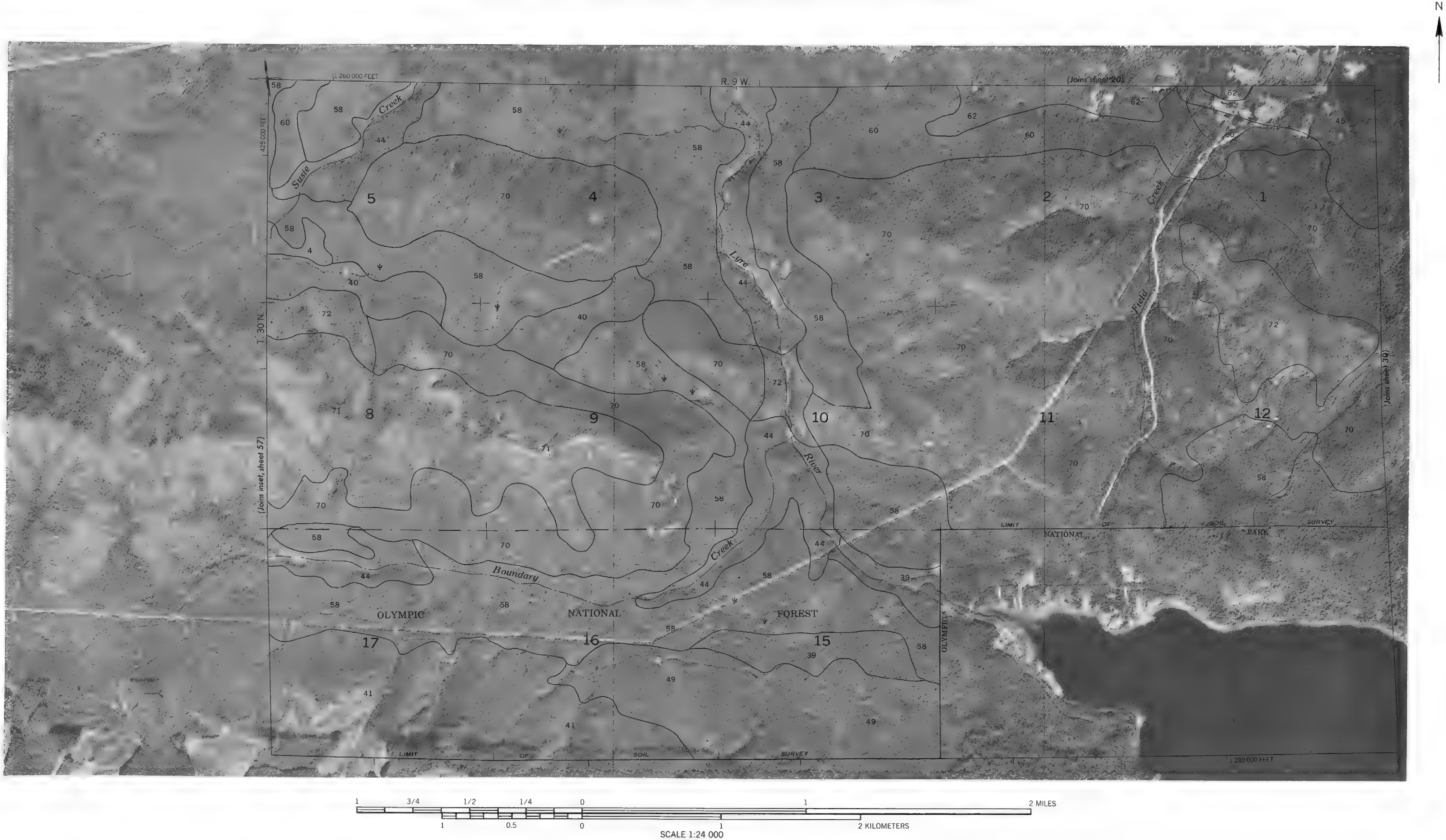



27
N
R. 12 W.
(Joins sheet 17)
(Joins sheet 26)
(Joins sheet 28)
(Joins sheet 39)
T. 30 N.
OLYMPIC
NATIONAL
FOREST
Cold Creek
Beaver Creek
Beaver Lake
Beaver Falls
Lake Creek
DEADMANS HILL
1 180 000 FEET
1
3/4
1/2
1/4
0
1
2 MILES
1
0.5
0
1
2 KILOMETERS
SCALE 1:24 000

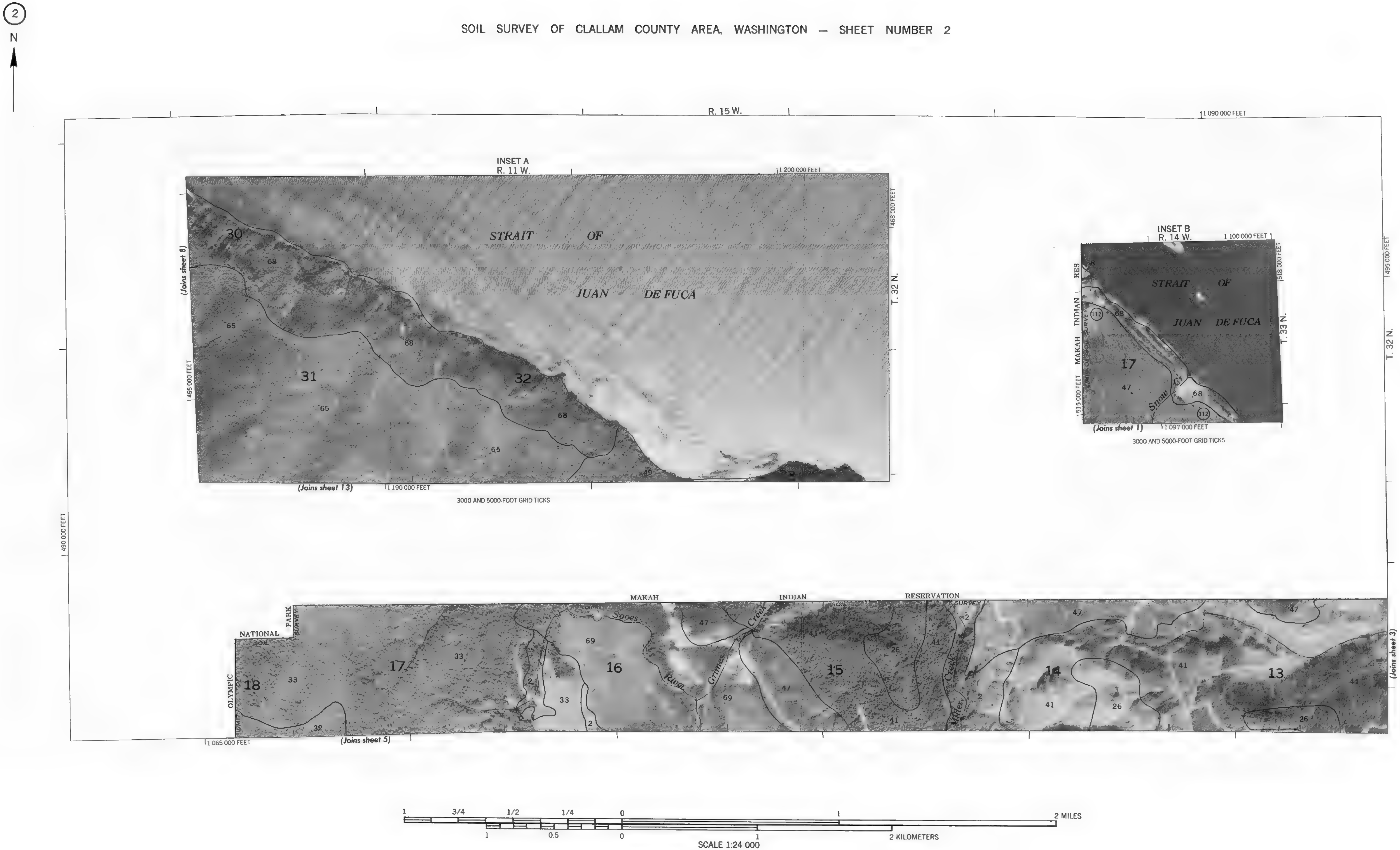
SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 28



SCALE 1:24 000


N
R. 9 W.
(Joins sheet 20)
(Joins sheet 30)
(Joins inset, sheet 57)
T. 30 N.
1 260 000 FEET
425 000 FEET
Susie Creek
Lyre River
Field Creek
Boundary Creek
OLYMPIC NATIONAL FOREST
OLYMPIC
LIMIT OF SOIL SURVEY
LIMIT NATIONAL OF SOIL PARK SURVEY
1 280 000 FEET
1
3/4
1/2
1/4
0
1
2 MILES
1
0.5
0
1
2 KILOMETERS
SCALE 1:24 000

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 2



SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 30

N

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 32

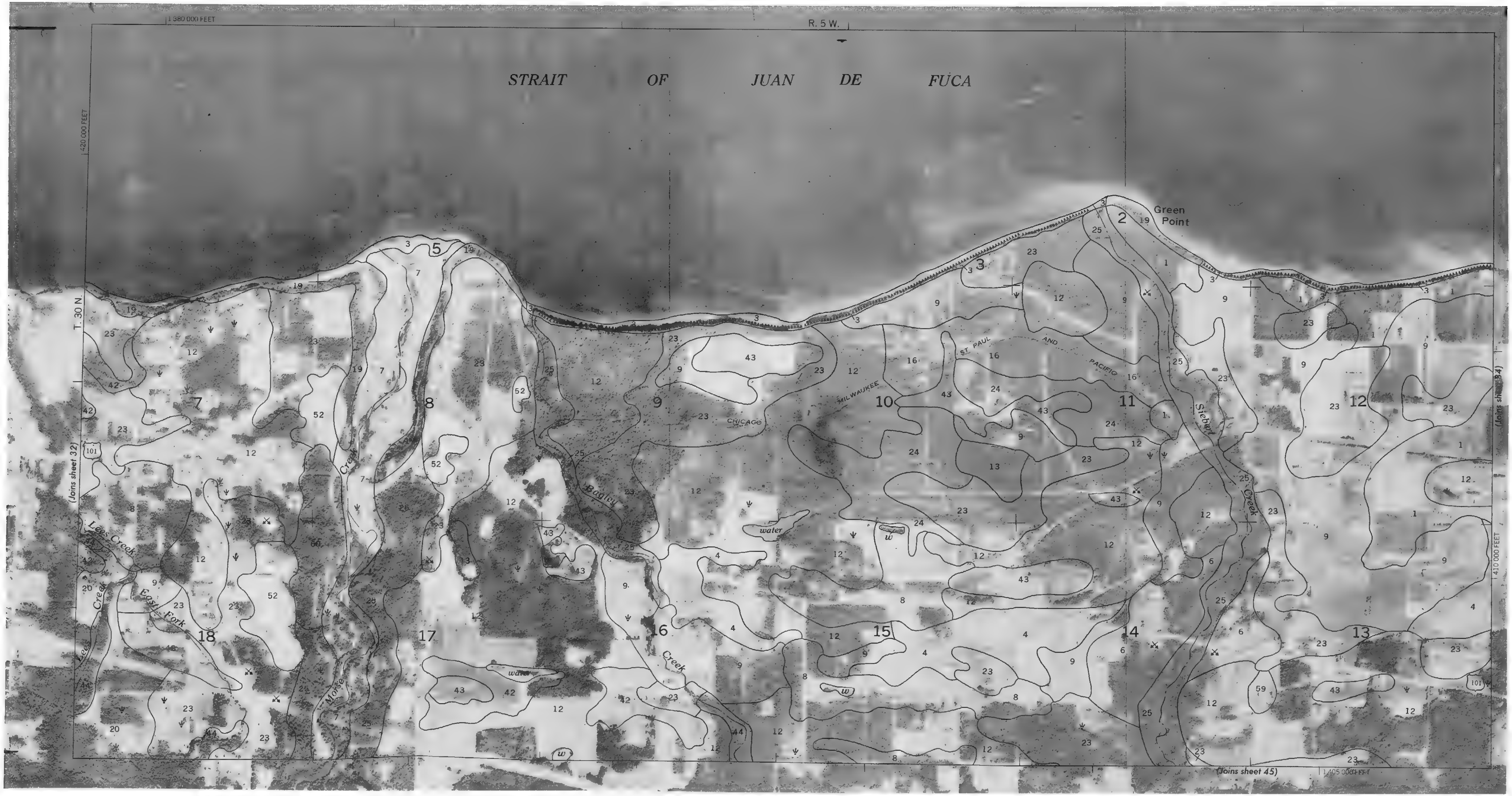
1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

33

N



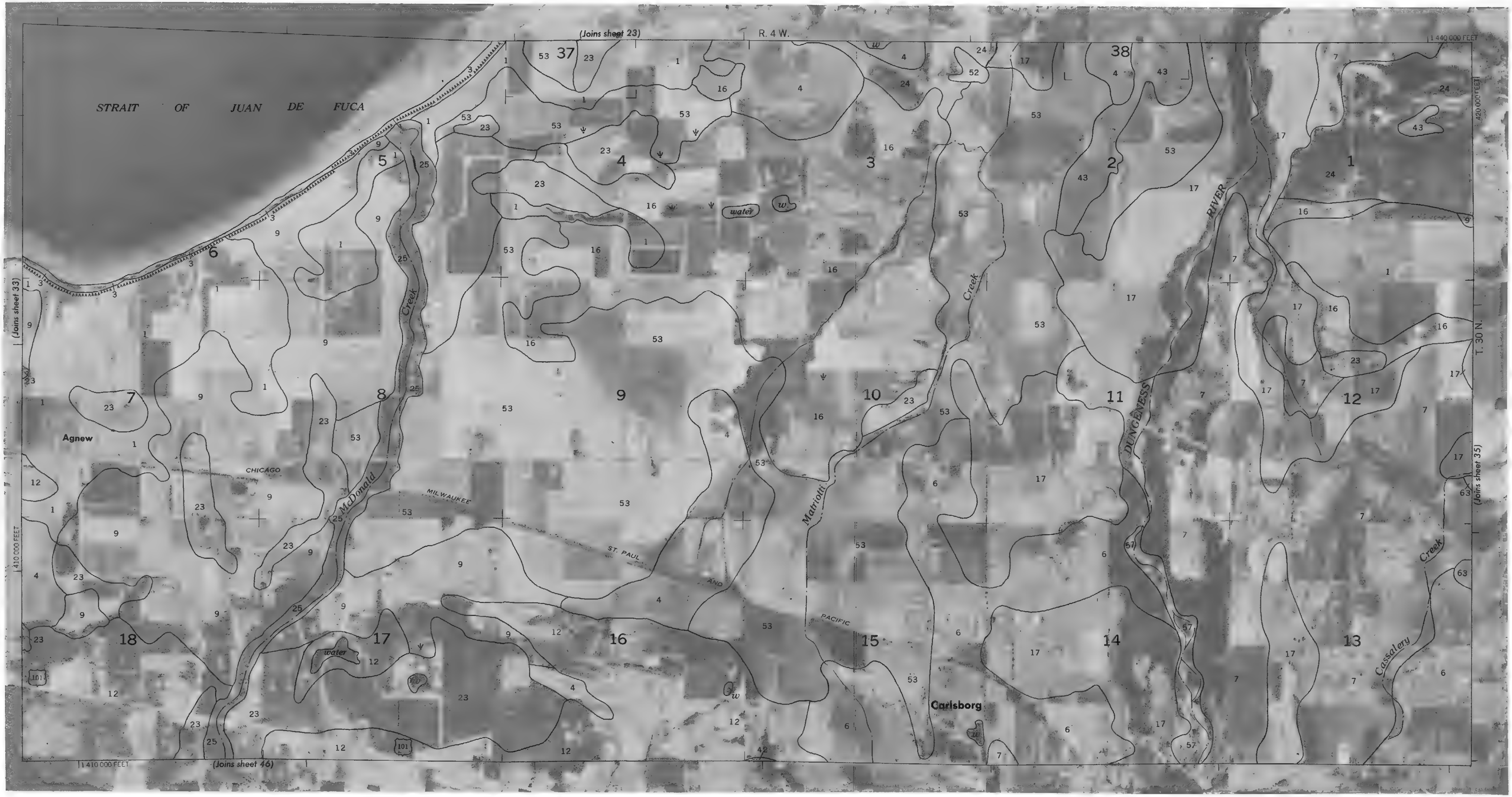
1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

N

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 34



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

N

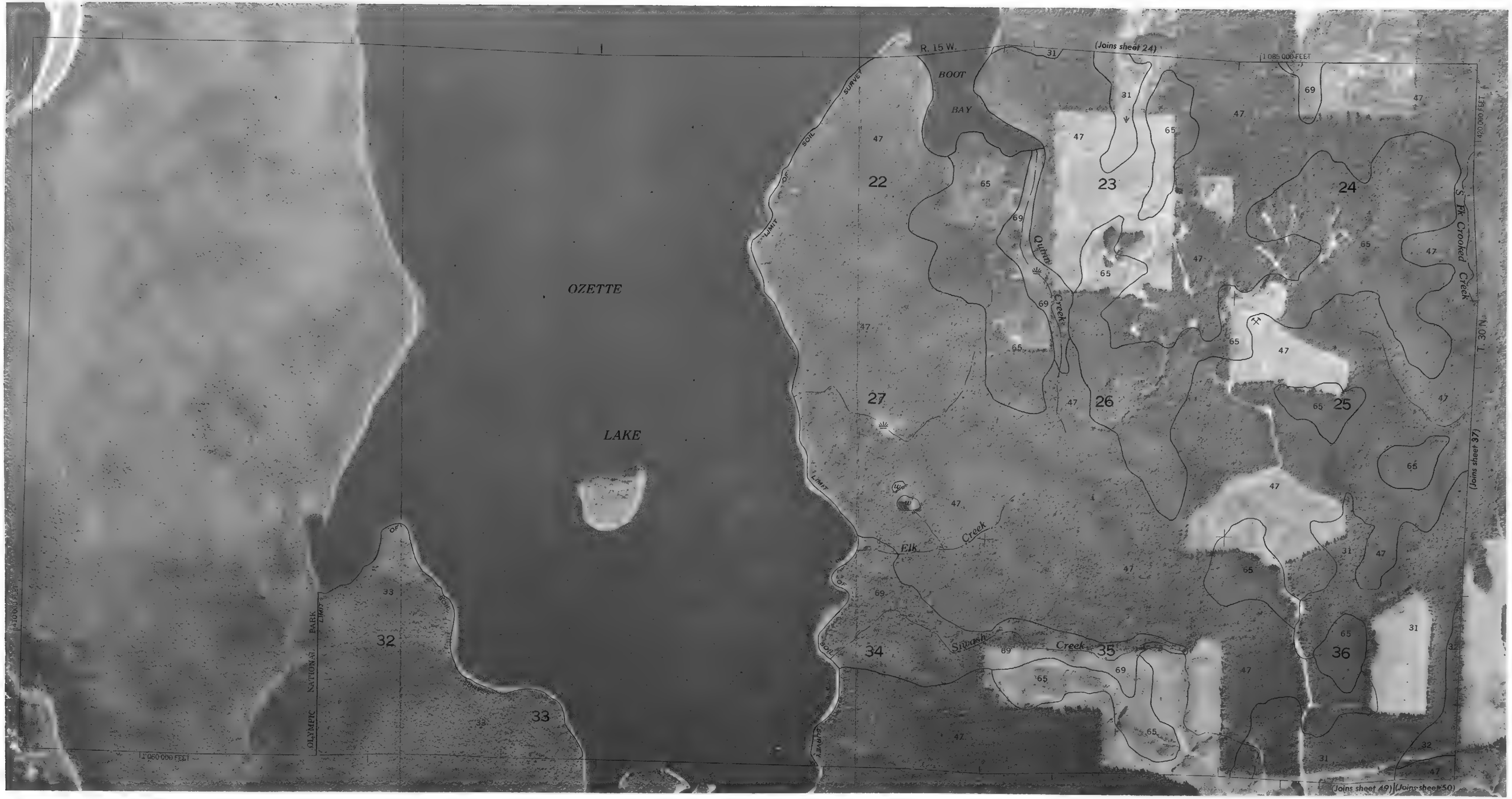
1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 36

N

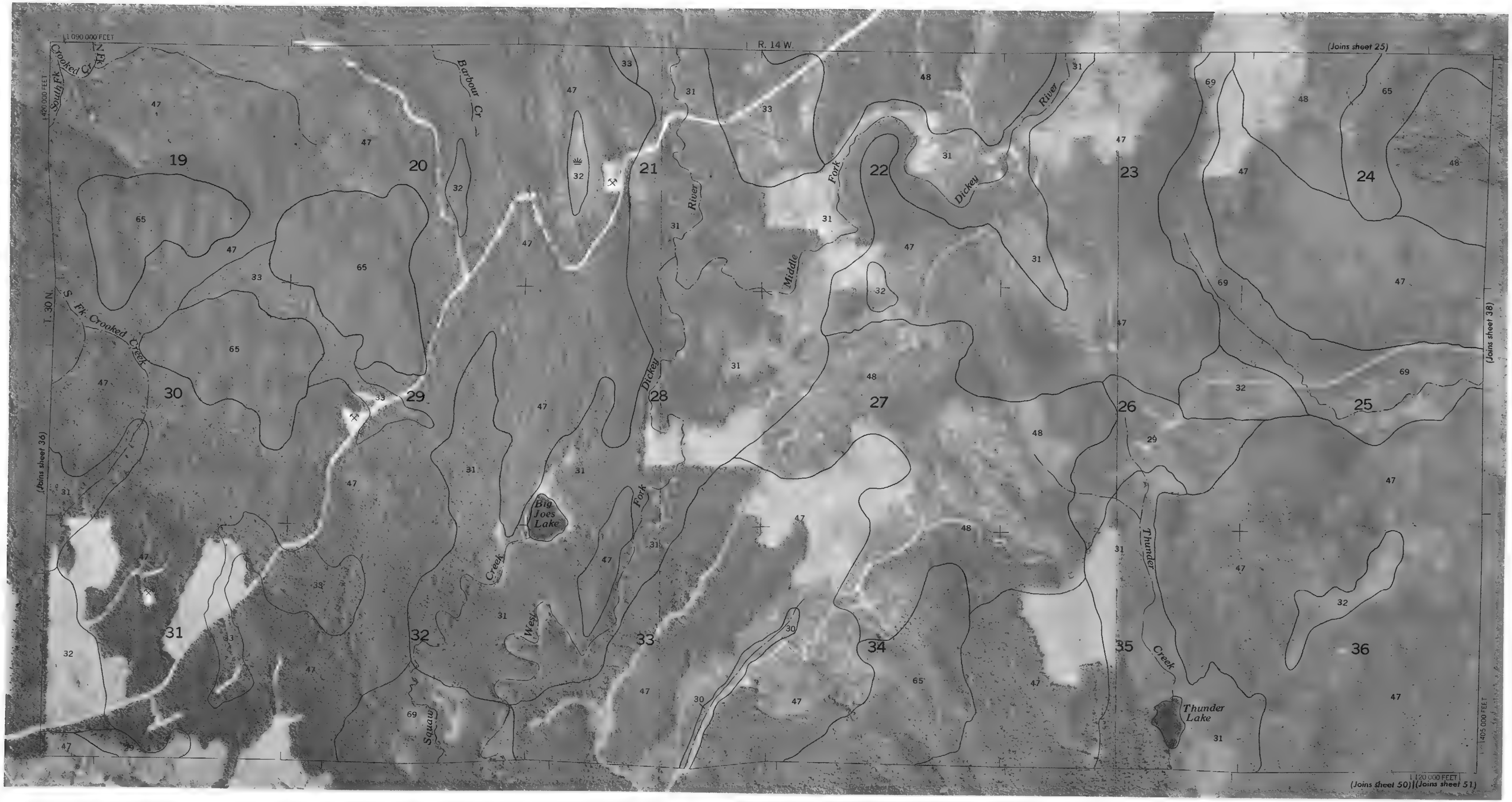


1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

N



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

N

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 38

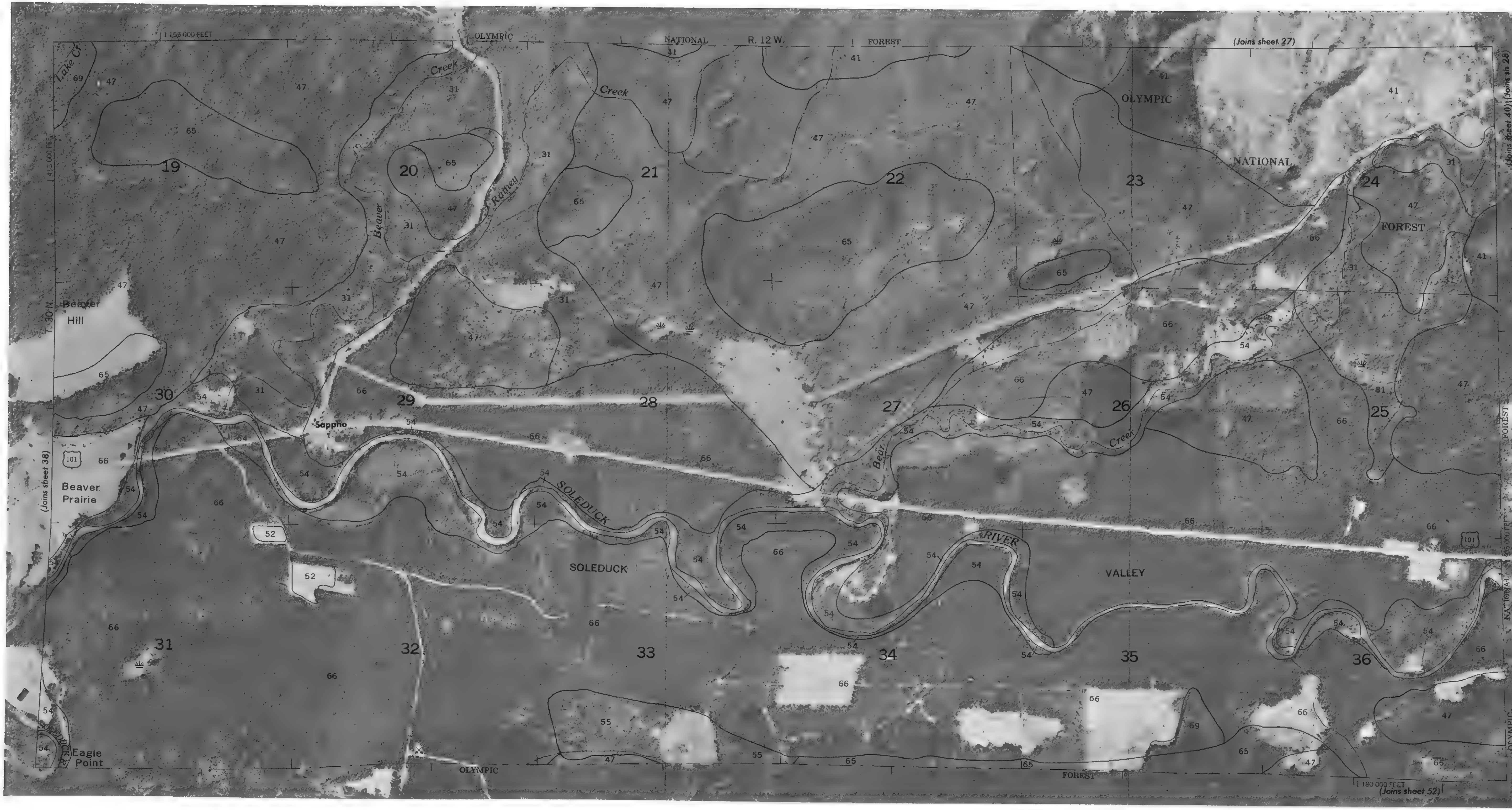
1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

39

N

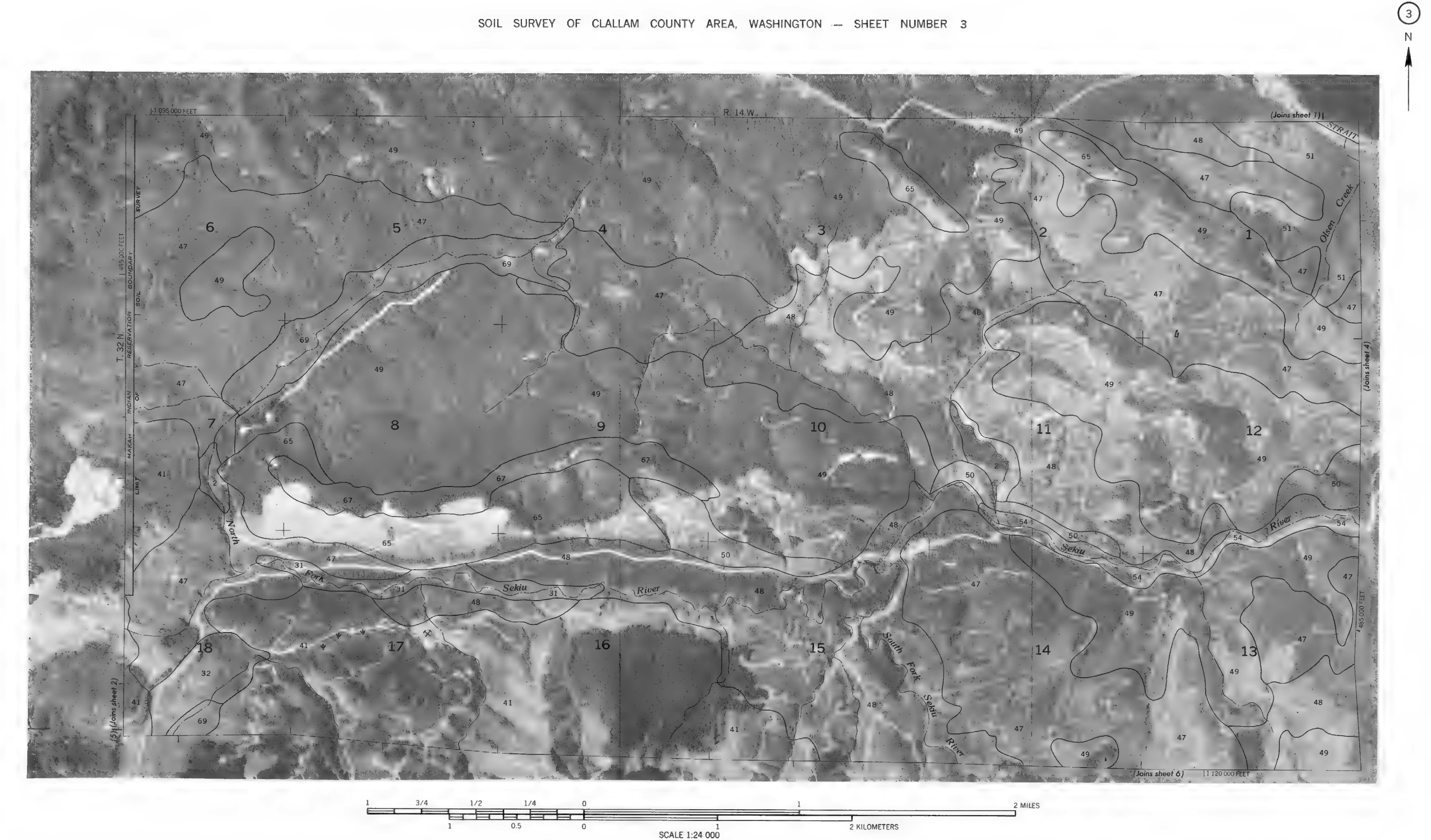


1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 3



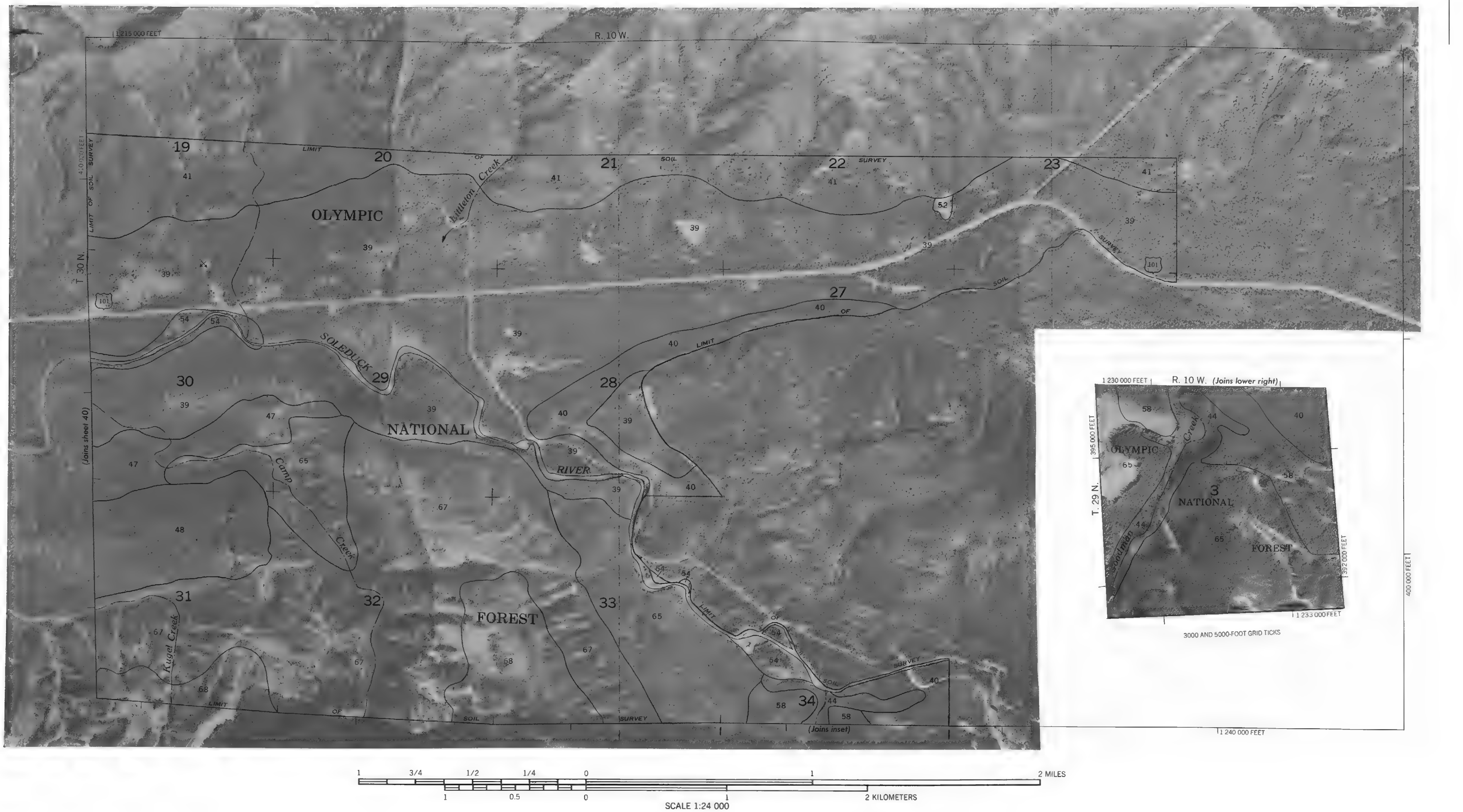
N

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 40

1 3/4 1/2 1/4 0 1 2 MILES

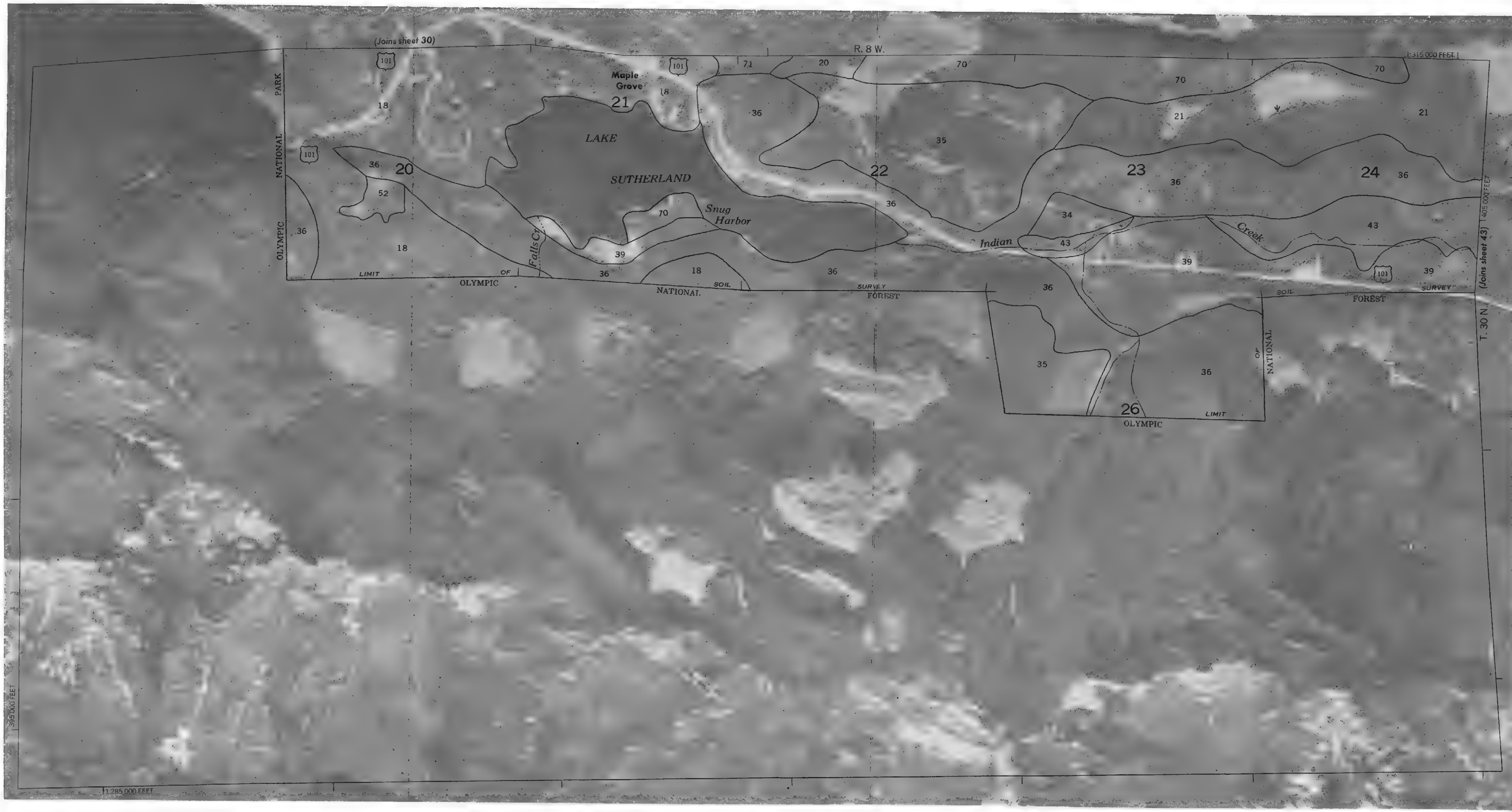
1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000


N
1 215 000 FEET
R. 10 W.
T. 30 N.
(Joins sheet 40)
OLYMPIC
NATIONAL
FOREST
SOLEDUCK
RIVER
Camp Creek
Kugel Creek
Bullleton Creek
(Joins inset)
1 230 000 FEET
R. 10 W. (Joins lower right)
T. 29 N.
395 000 FEET
392 000 FEET
1 233 000 FEET
1 240 000 FEET
400 000 FEET
3000 AND 5000-FOOT GRID TICKS
1
3/4
1/2
1/4
0
1
2 MILES
1
0.5
0
1
2 KILOMETERS
SCALE 1:24 000

N

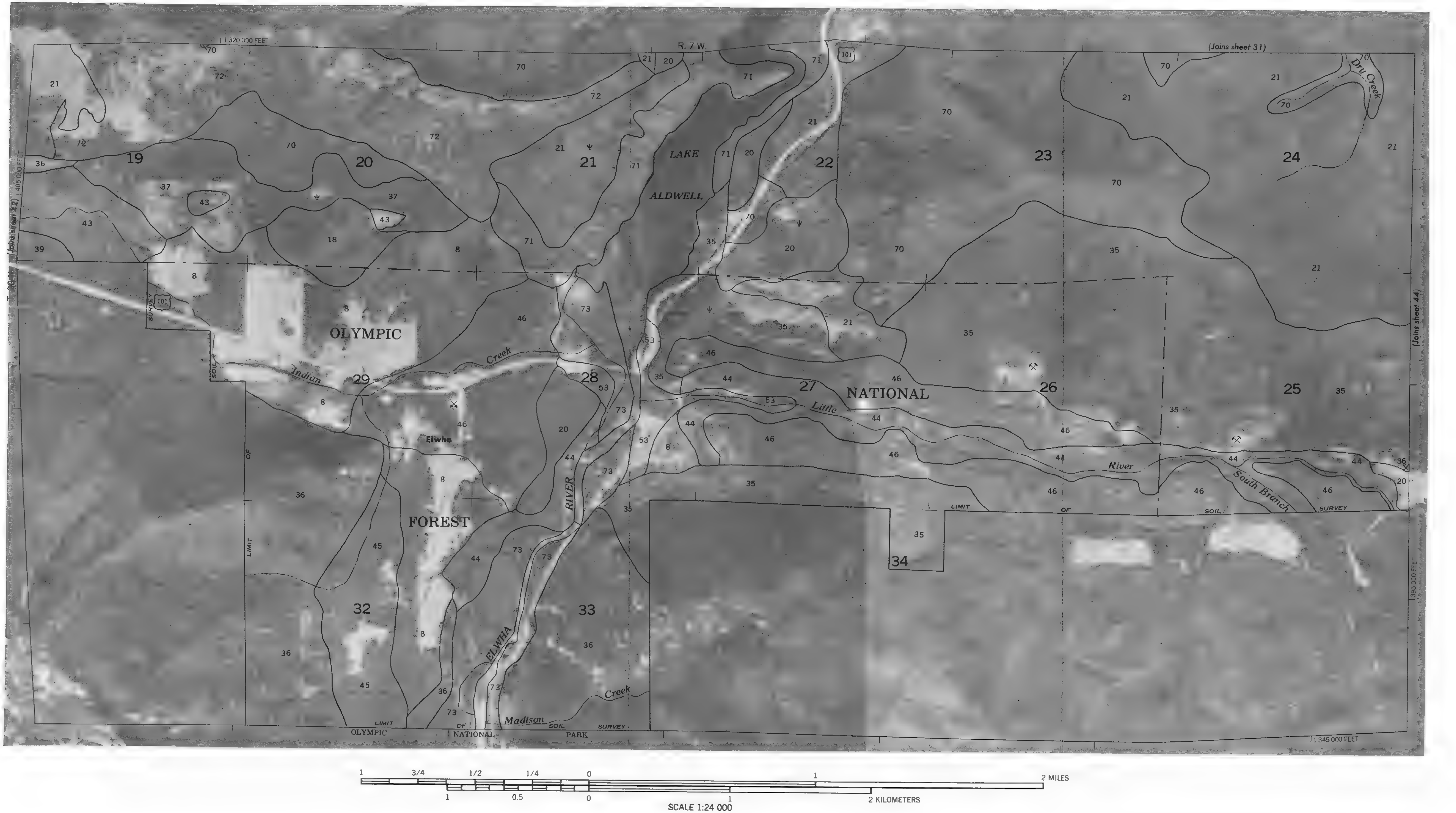
SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 42



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000


N
(Joins sheet 31)
(Joins sheet 42)
(Joins sheet 44)
R. 7 W.
1 320 000 FEET
1 345 000 FEET
405 000 FEET
395 000 FEET
LAKE
ALDWELL
OLYMPIC
NATIONAL
FOREST
Indian
Creek
Little
River
South Branch
Dry Creek
ELWHA
RIVER
Madison
Creek
Elwha
101
LIMIT OF SOIL SURVEY
OLYMPIC NATIONAL PARK
19
20
21
22
23
24
25
26
27
28
29
32
33
34
1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 44

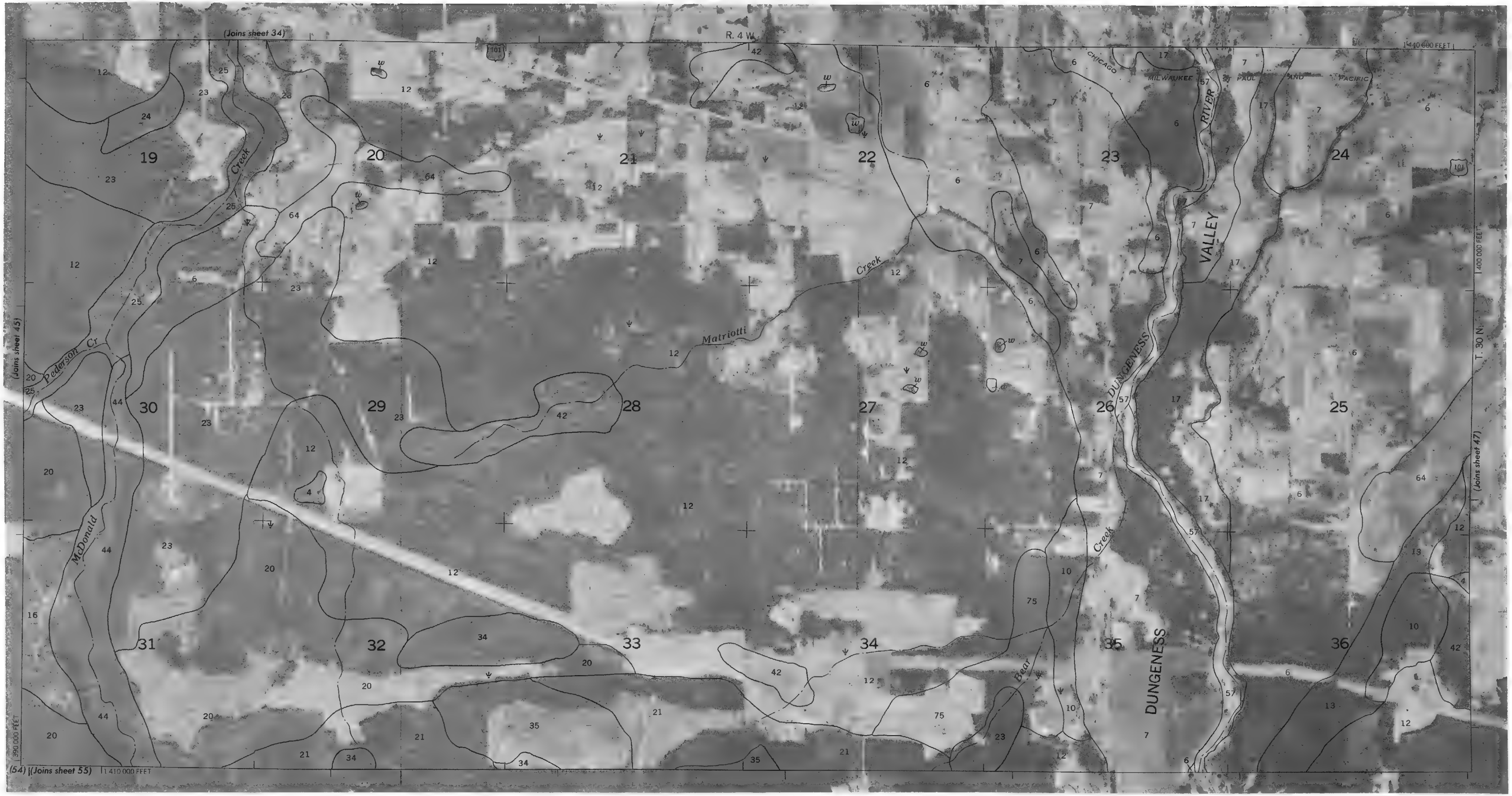
1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

N

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 46



1 3/4 1/2 1/4 0 1 2 MILES

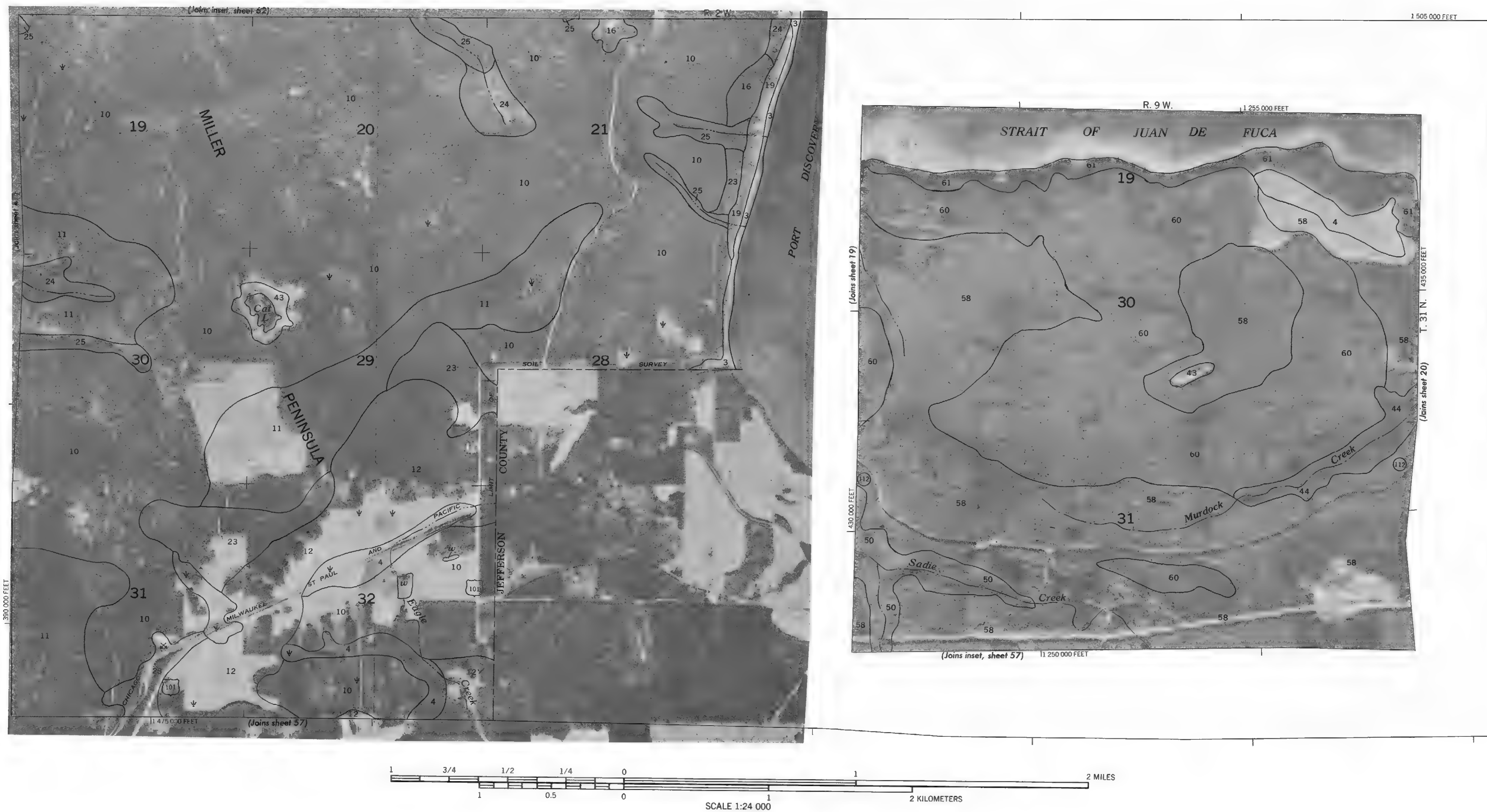
1 0.5 0 1 2 KILOMETERS

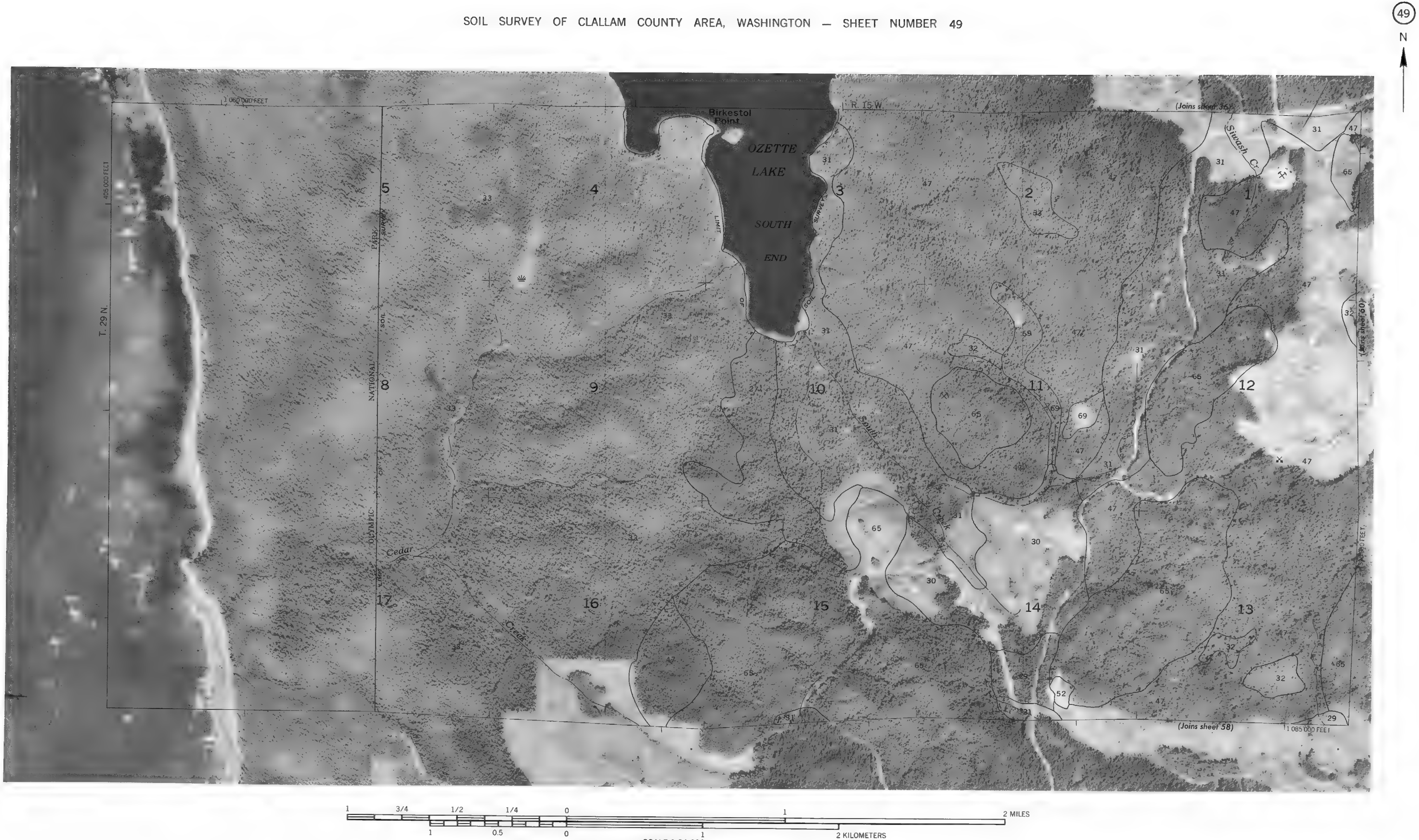
SCALE 1:24 000


47
N
R. 3 W.
T. 30 N.
STRAIT OF JUAN DE FUCA
(Joins sheet 35)
(Joins sheet 48)
(Joins sheet 56)
(Joins sheet 46)
SEQUIM
SEQUIM PRAIRIE
Creek
Bell
Gibson Spit
The Lagoon
Travis Spit
Klapot Point
The Middle Ground
Paradise Cove
PENINSULA
MILLER
SEQUIM BAY
Pitship Point
Hardwick Point
Goose Point
CHICAGO MILWAUKEE ST. PAUL AND PACIFIC
Bell Hill
Smith Lake
HAPPY VALLEY
Johnson Creek
101
1 445 000 FEET
1 470 000 FEET
390 000 FEET
19
20
21
22
23
24
25
27
28
29
30
31
32
33
34
35
36
1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

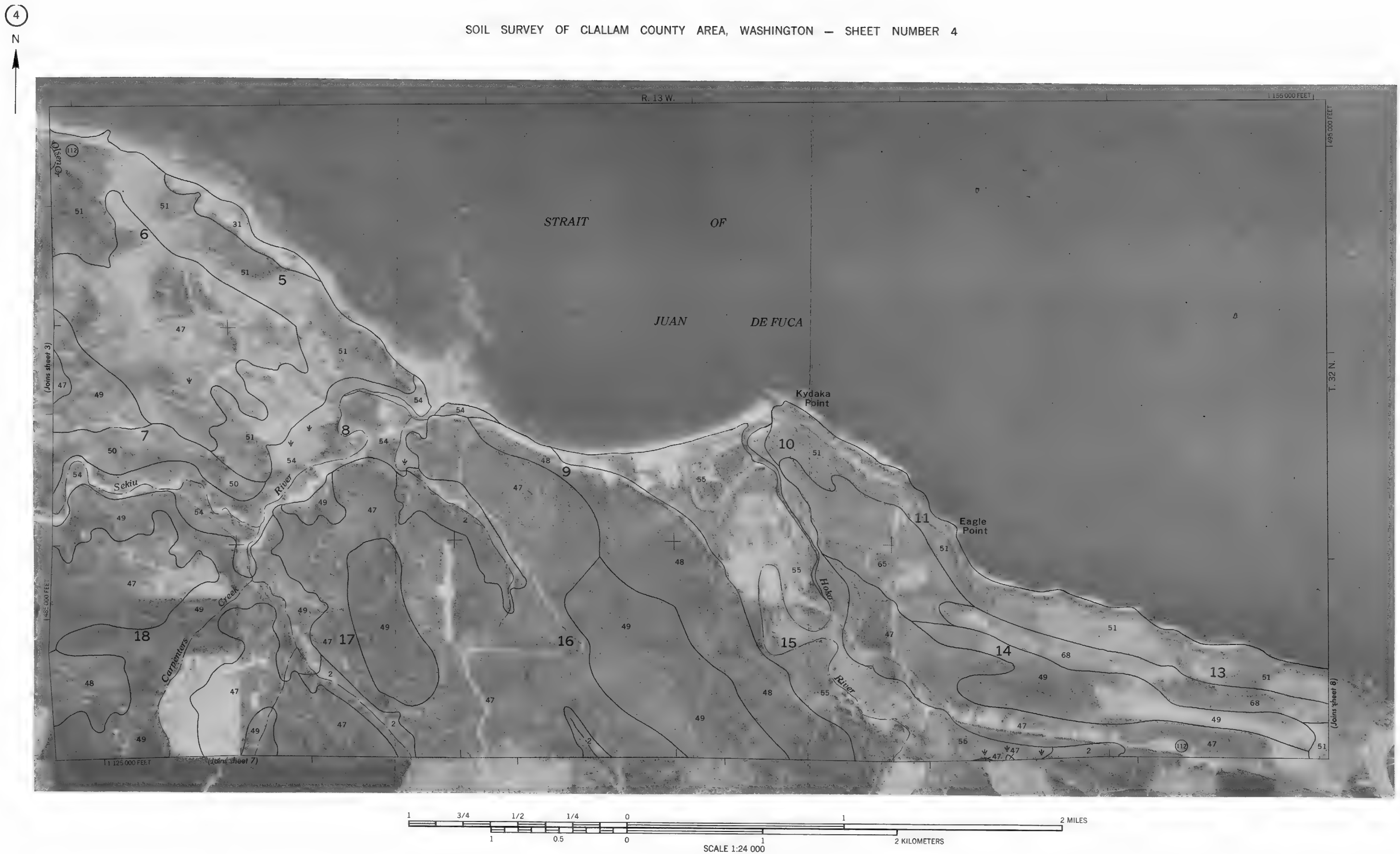
N

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 48

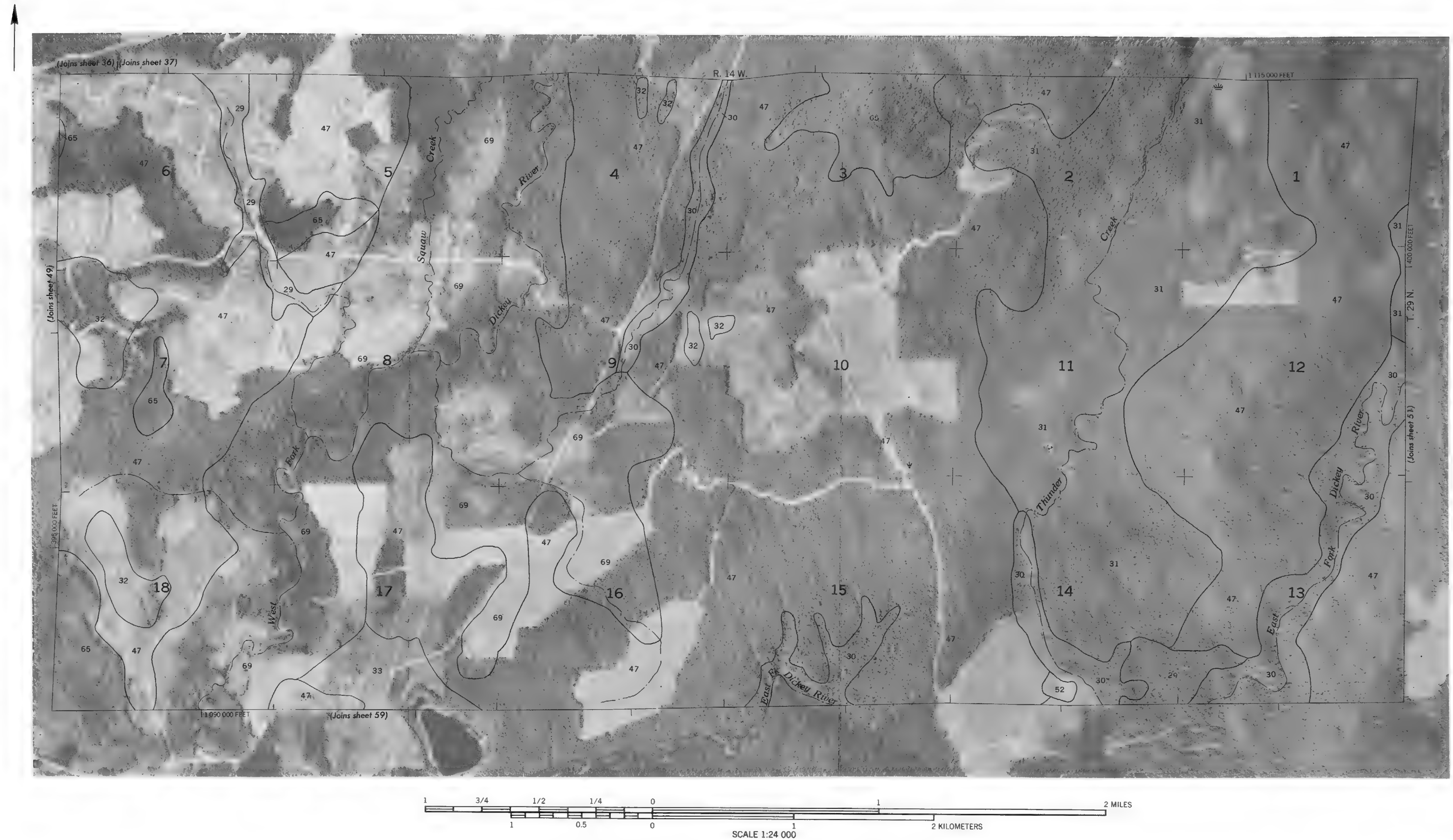



49
N
OZETTE LAKE
SOUTH END
Birkestol Point
R. 15 W.
T. 29 N.
(Joins sheet 36)
(Joins sheet 58)
(Joins sheet 50)
1 060 000 FEET
1 085 000 FEET
405 000 FEET
OLYMPIC NATIONAL PARK SOIL SURVEY LIMIT
LIMIT OF SOIL SURVEY
Siwash Cr.
South Creek
Cedar Creek
1
3/4
1/2
1/4
0
1
2 MILES
1
0.5
0
1
2 KILOMETERS
SCALE 1:24 000

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 4



SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 50



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 52

1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

53

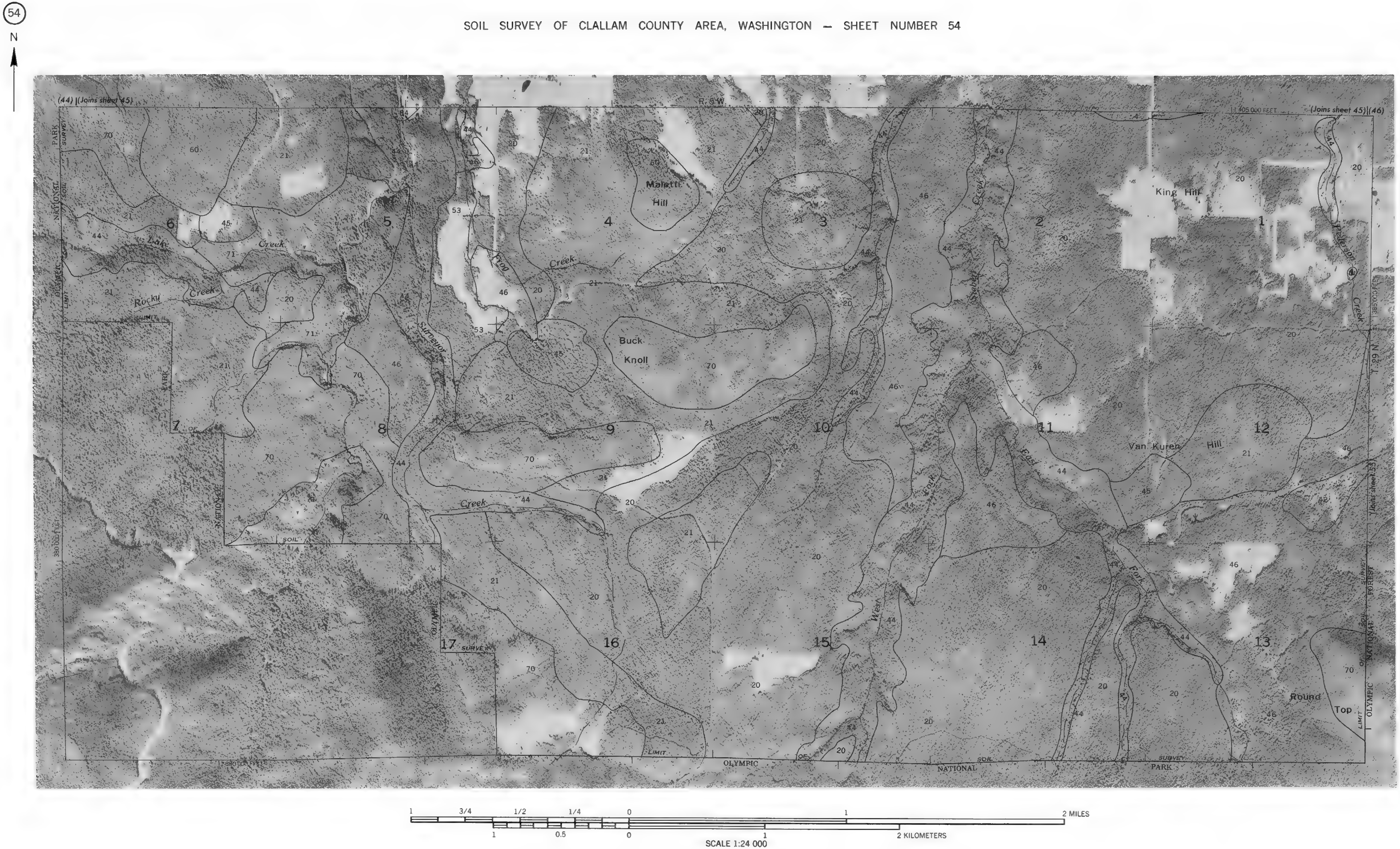
N

SCALE 1:24 000

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 54



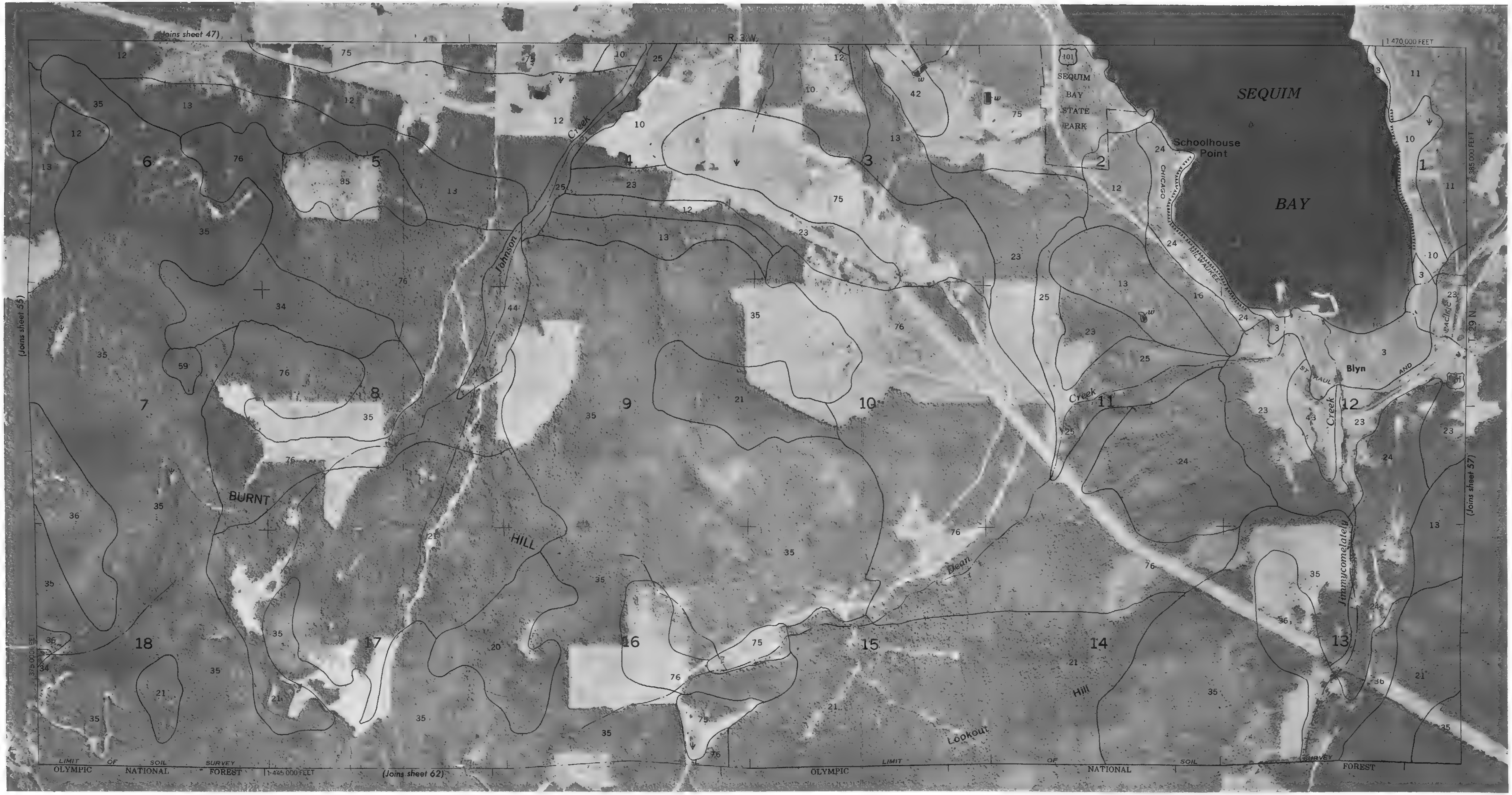
N

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

N



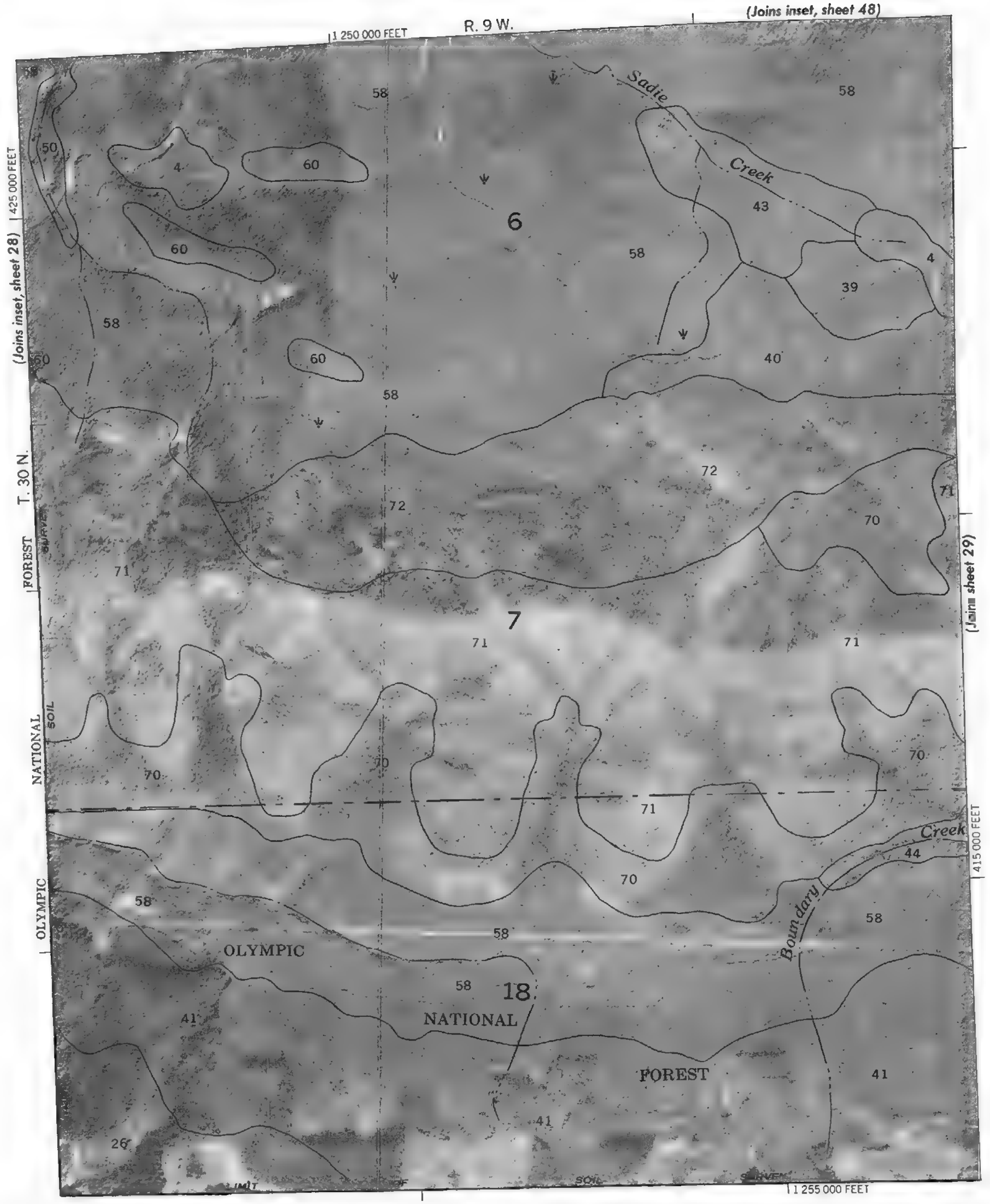
1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

57

N

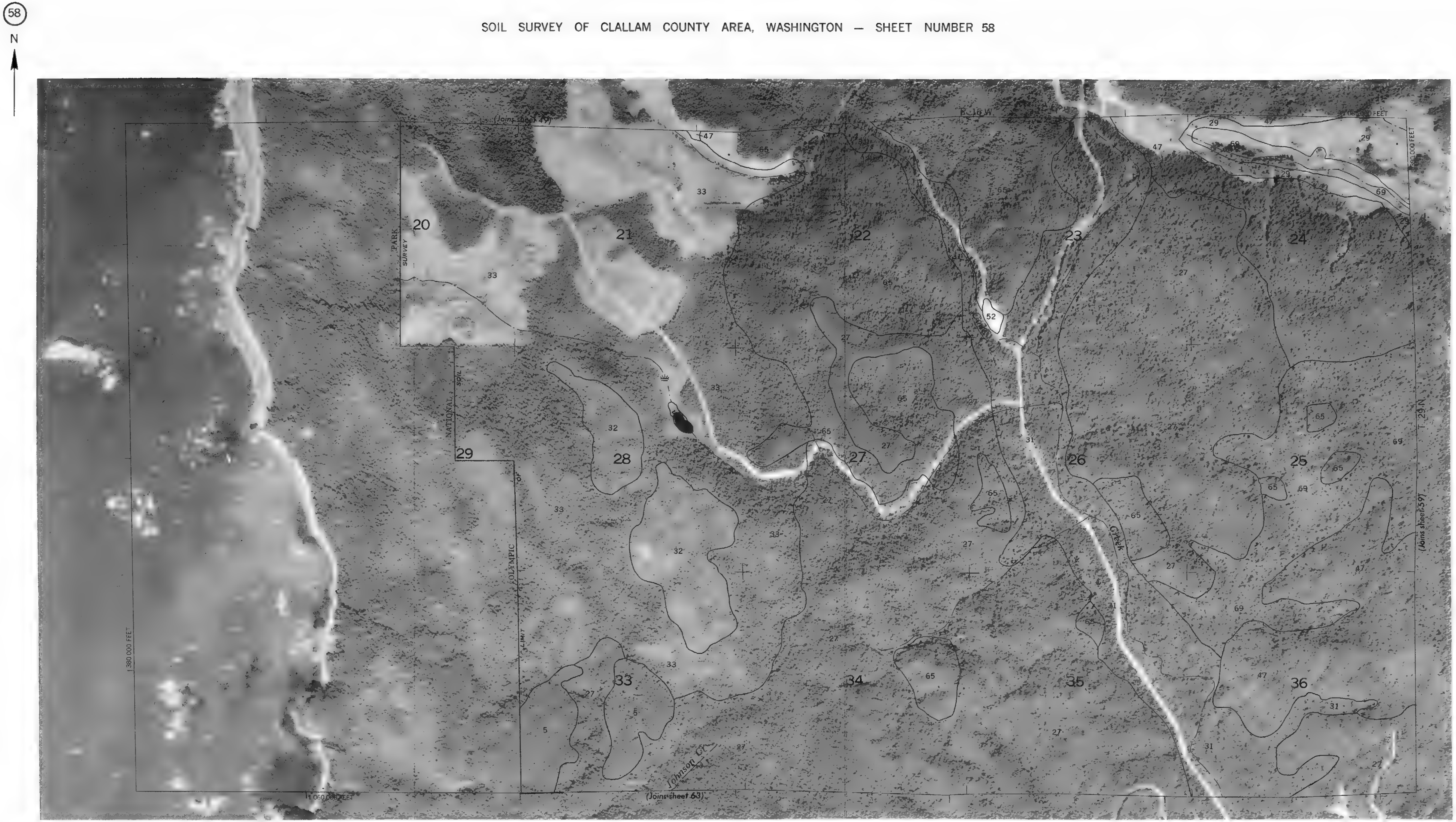


1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

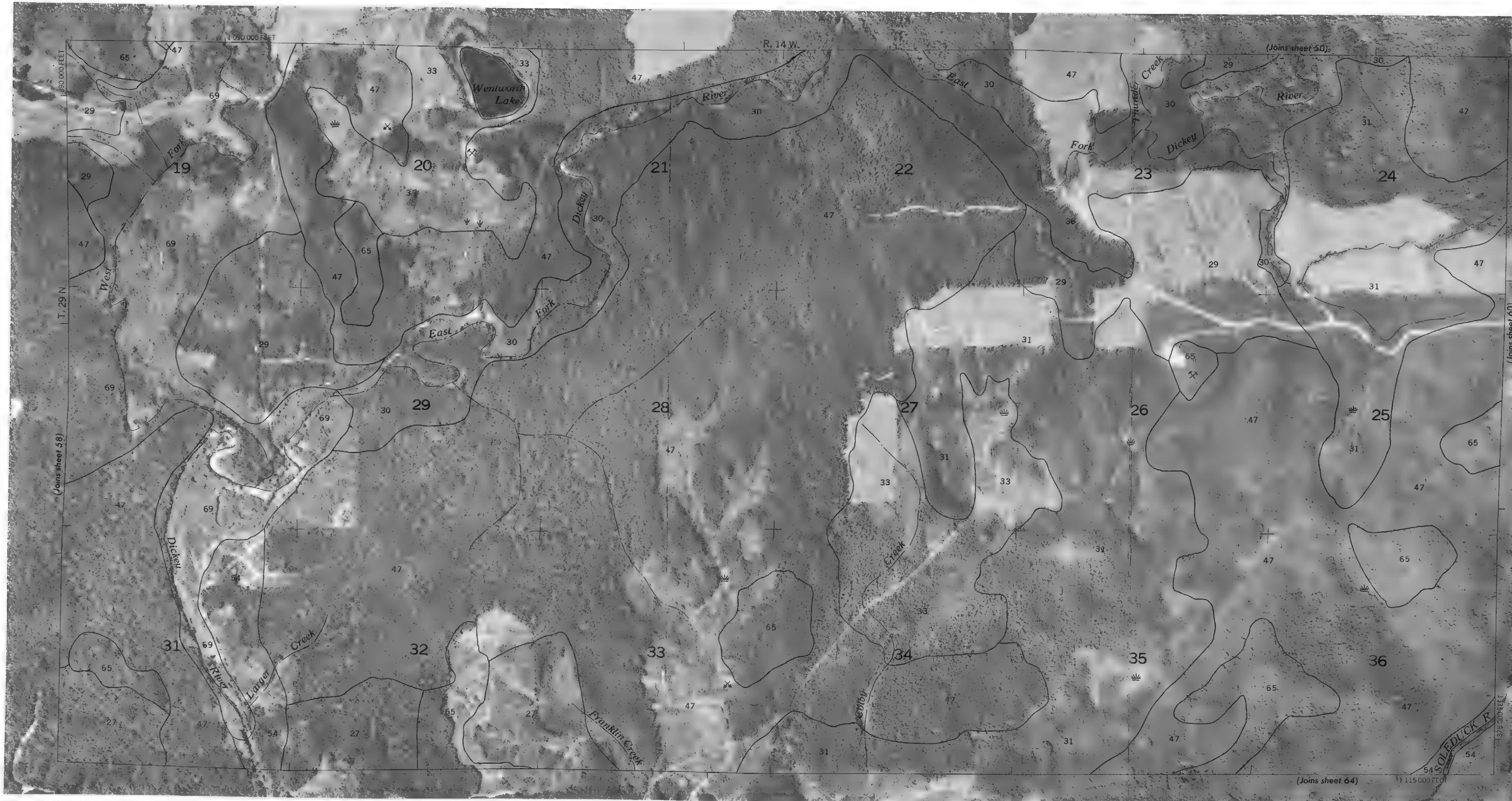
SCALE 1:24 000

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 58



1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

N



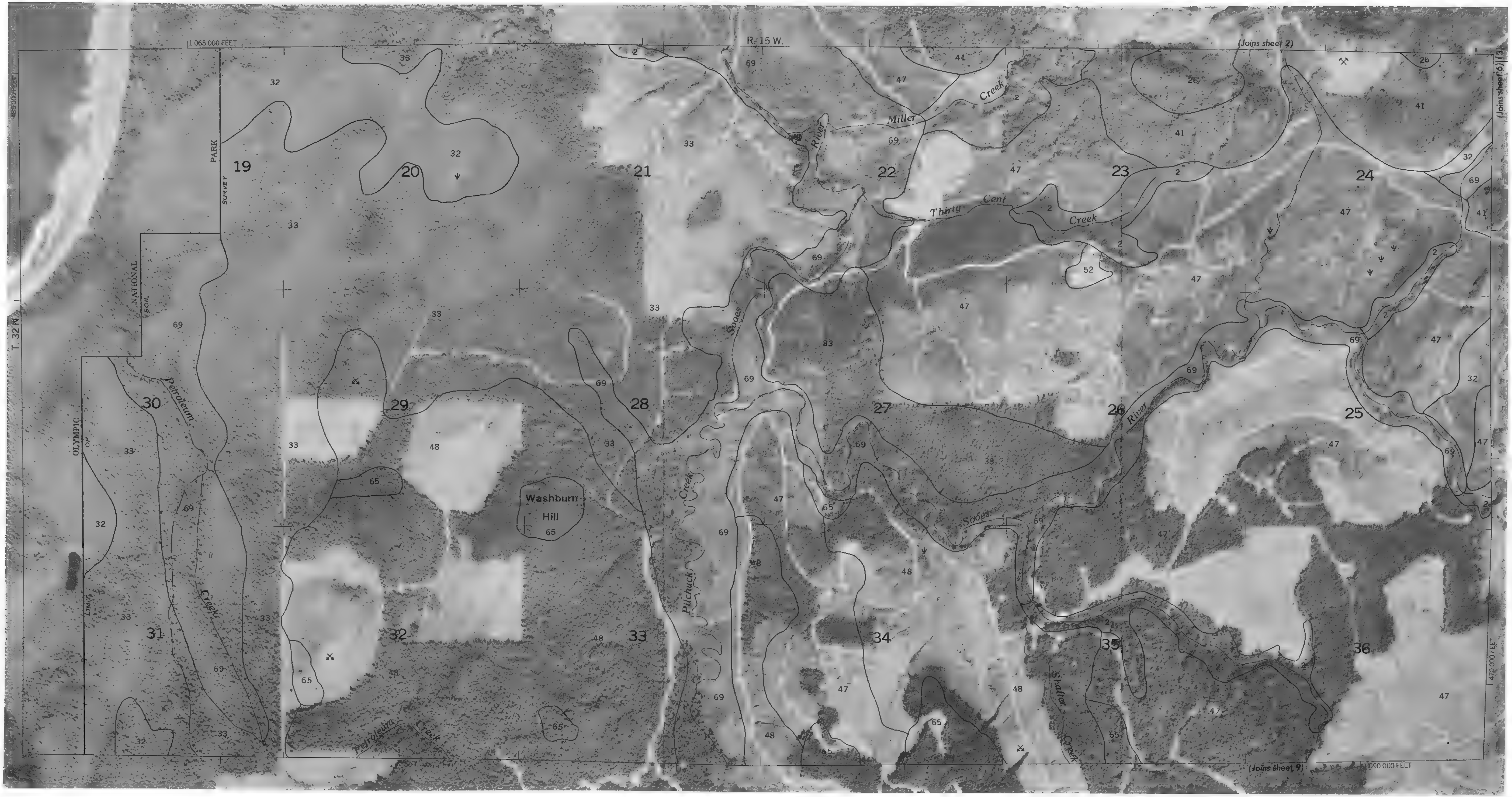
1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

5

N



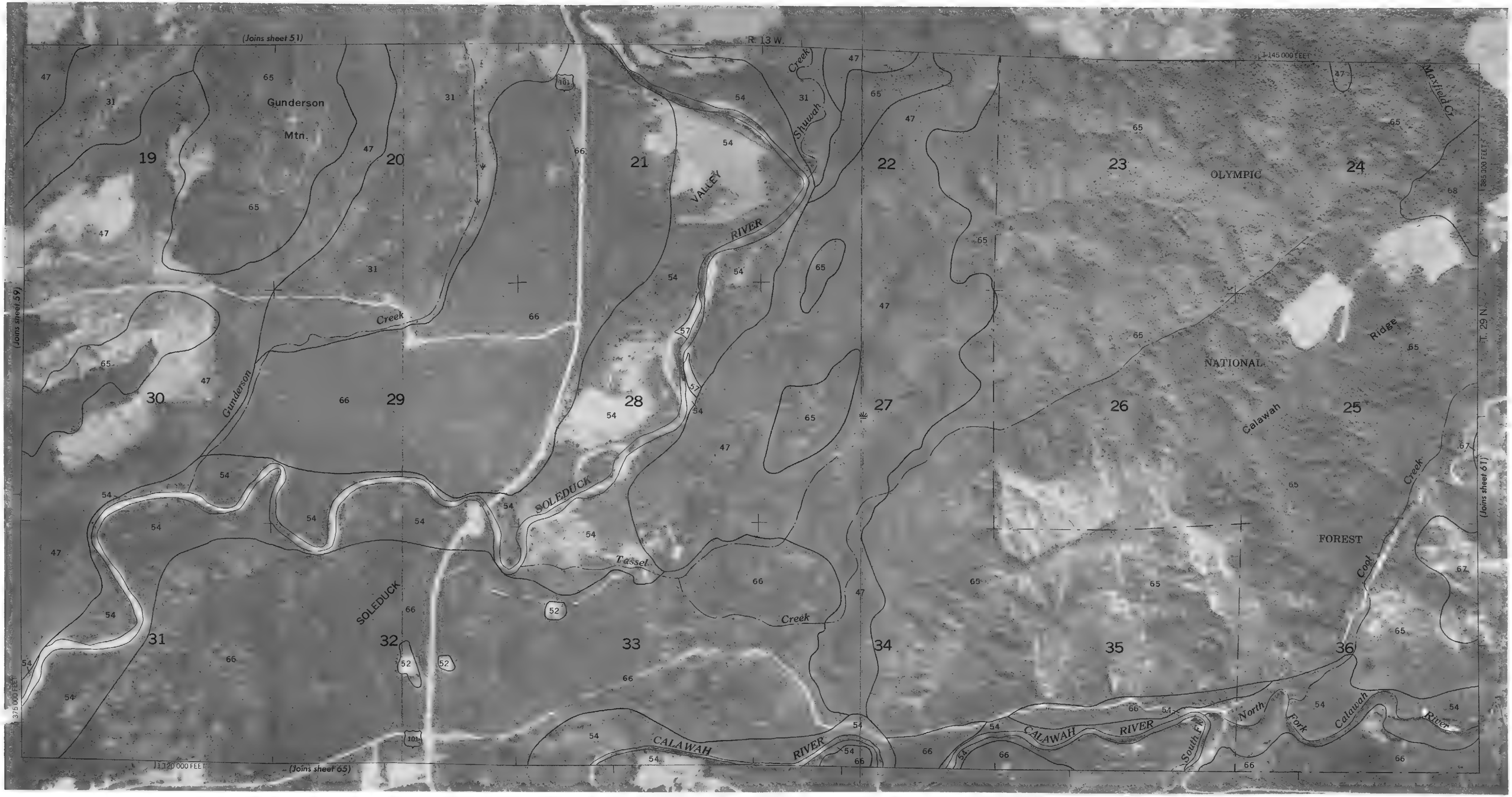
1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

N

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 60

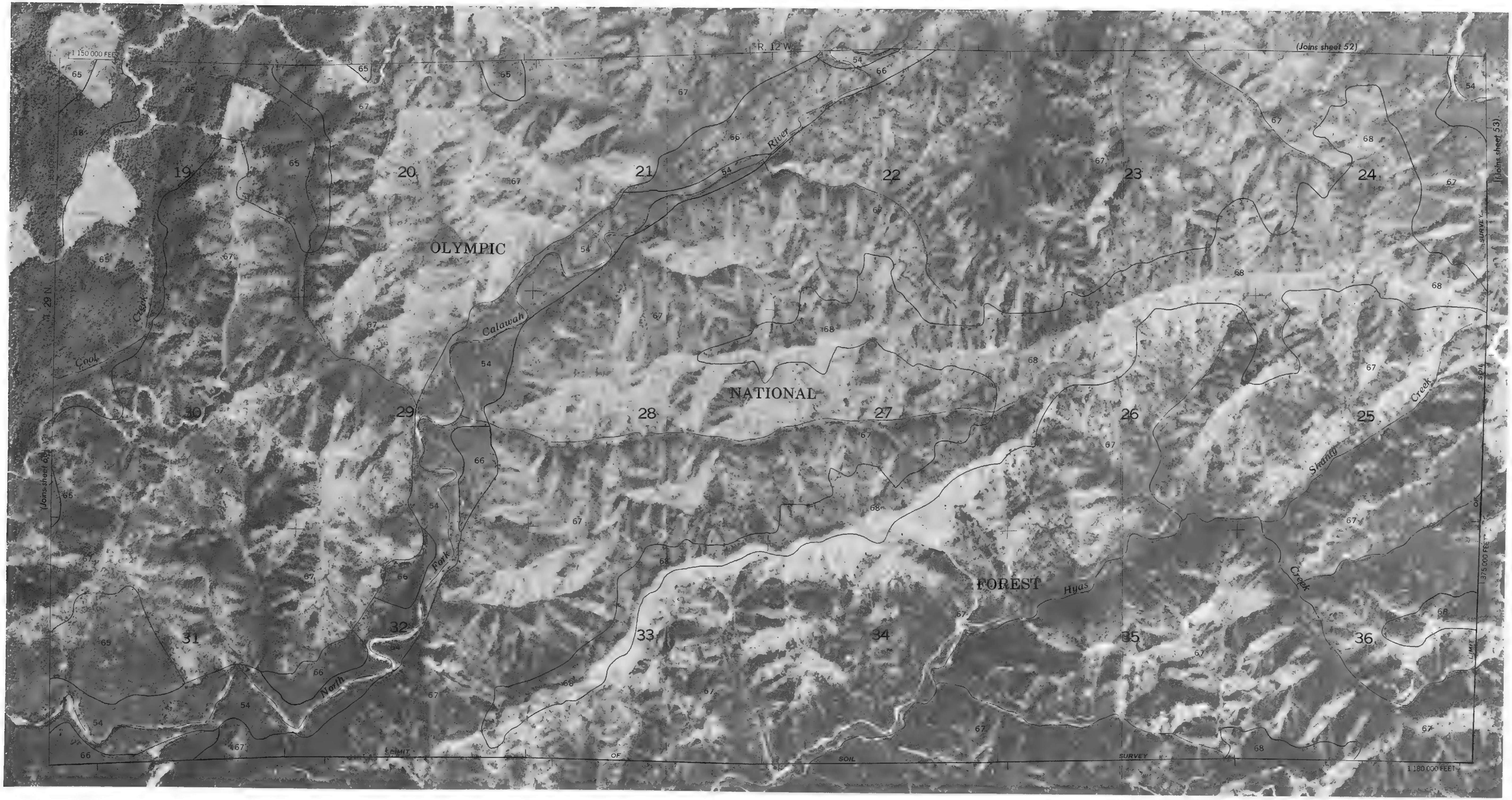


1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

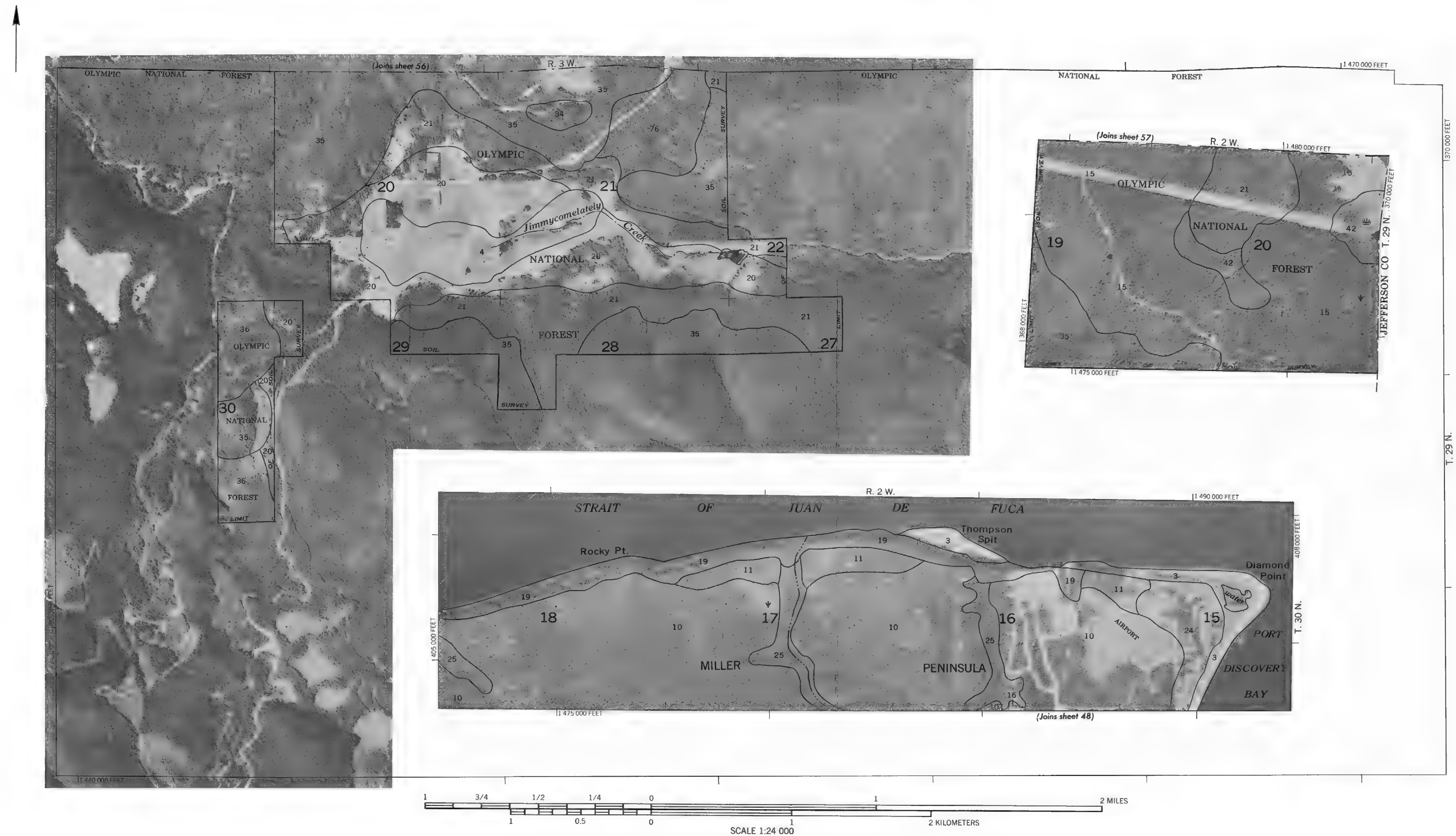
N

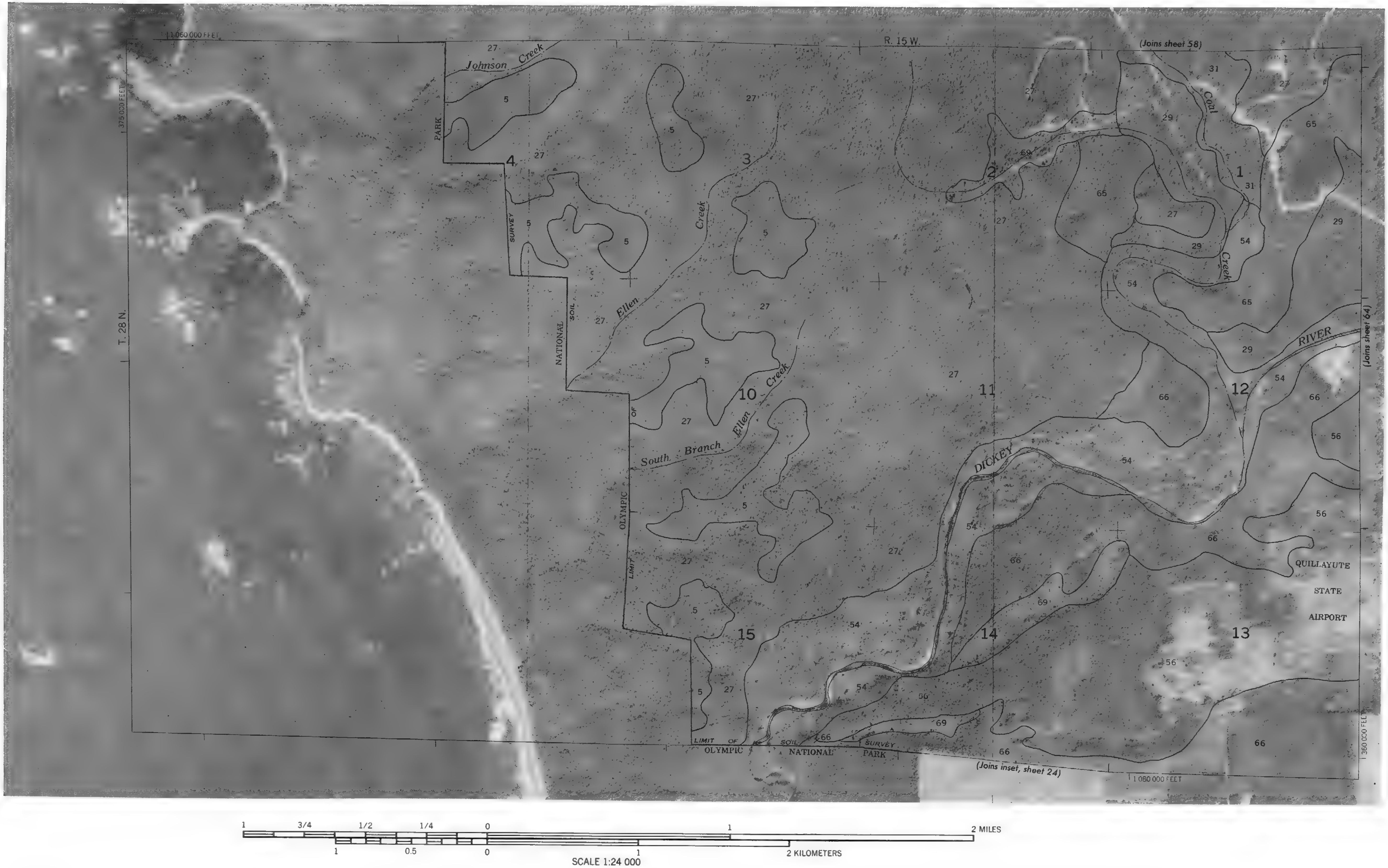


1 3/4 1/2 1/4 0 1 2 MILES

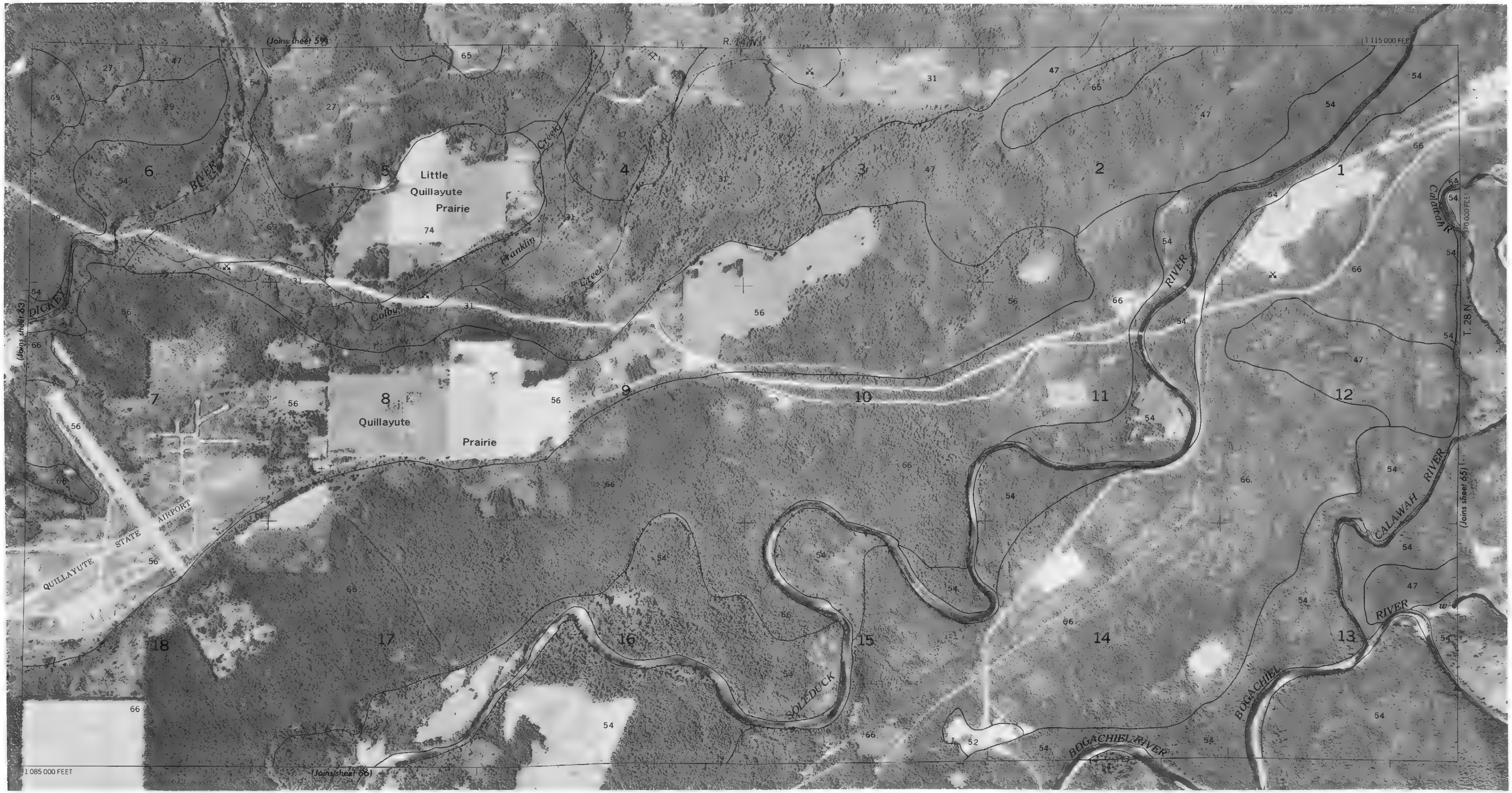
1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000


N
(Joins sheet 56)
R. 3 W.
OLYMPIC NATIONAL FOREST
Jimmycomelately Creek
SOIL SURVEY LIMIT
(Joins sheet 57)
R. 2 W.
JEFFERSON CO
T. 29 N.
1 470 000 FEET
1 480 000 FEET
1 475 000 FEET
370 000 FEET
368 000 FEET
STRAIT OF JUAN DE FUCA
Thompson Spit
Rocky Pt.
Diamond Point
MILLER PENINSULA
AIRPORT
PORT DISCOVERY BAY
T. 30 N.
1 490 000 FEET
408 000 FEET
405 000 FEET
(Joins sheet 48)
1 440 000 FEET
2 MILES
2 KILOMETERS
SCALE 1:24 000


N
(Joins sheet 58)
R. 15 W.
T. 28 N.
(Joins sheet 64)
(Joins inset, sheet 24)
1 060 000 FEET
1 080 000 FEET
375 000 FEET
360 000 FEET
Johnson Creek
Ellen Creek
South Branch Ellen Creek
Coal Creek
DICKEY RIVER
QUILLAYUTE STATE AIRPORT
LIMIT OF OLYMPIC NATIONAL PARK SOIL SURVEY
1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

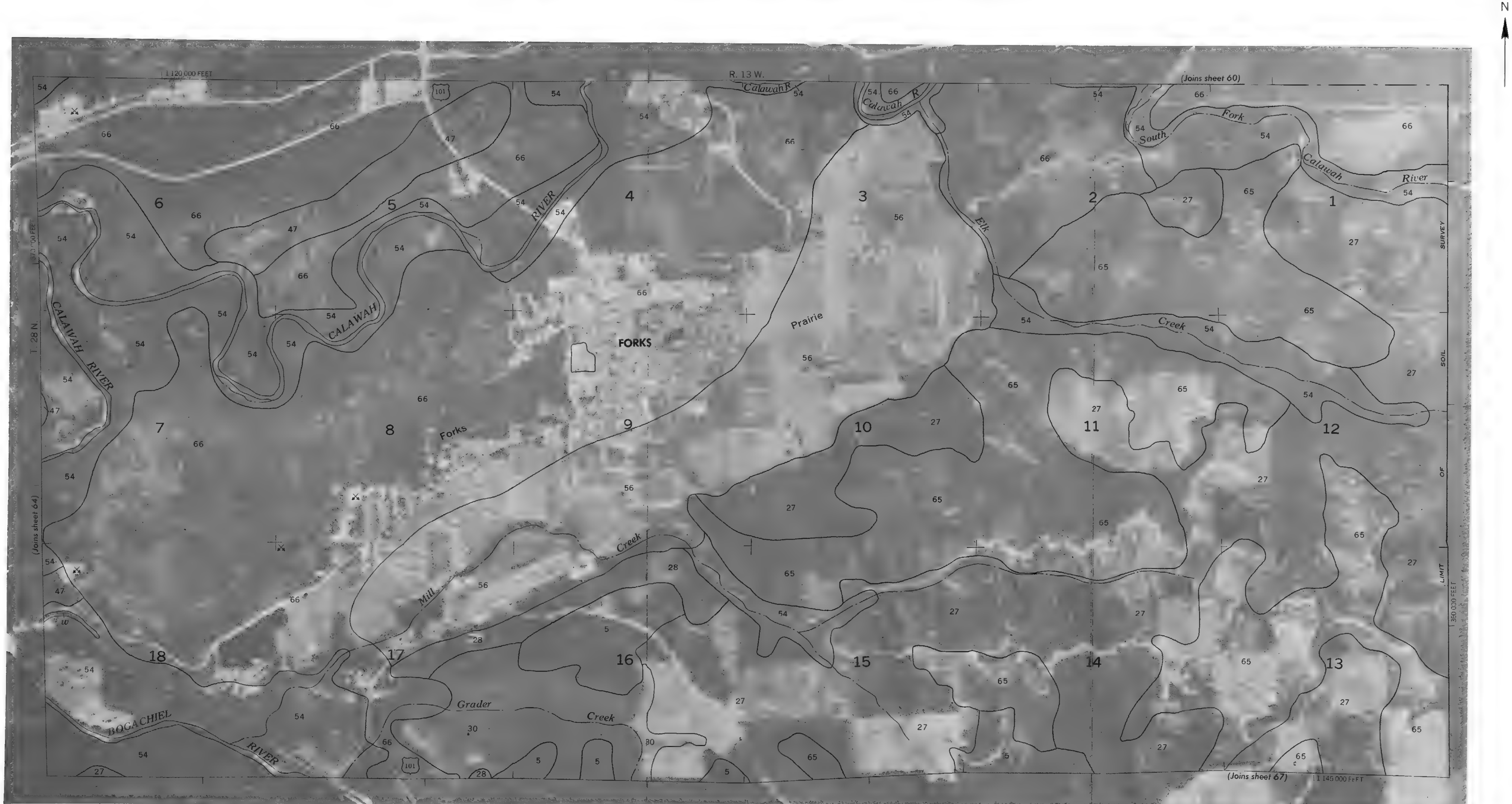
N



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

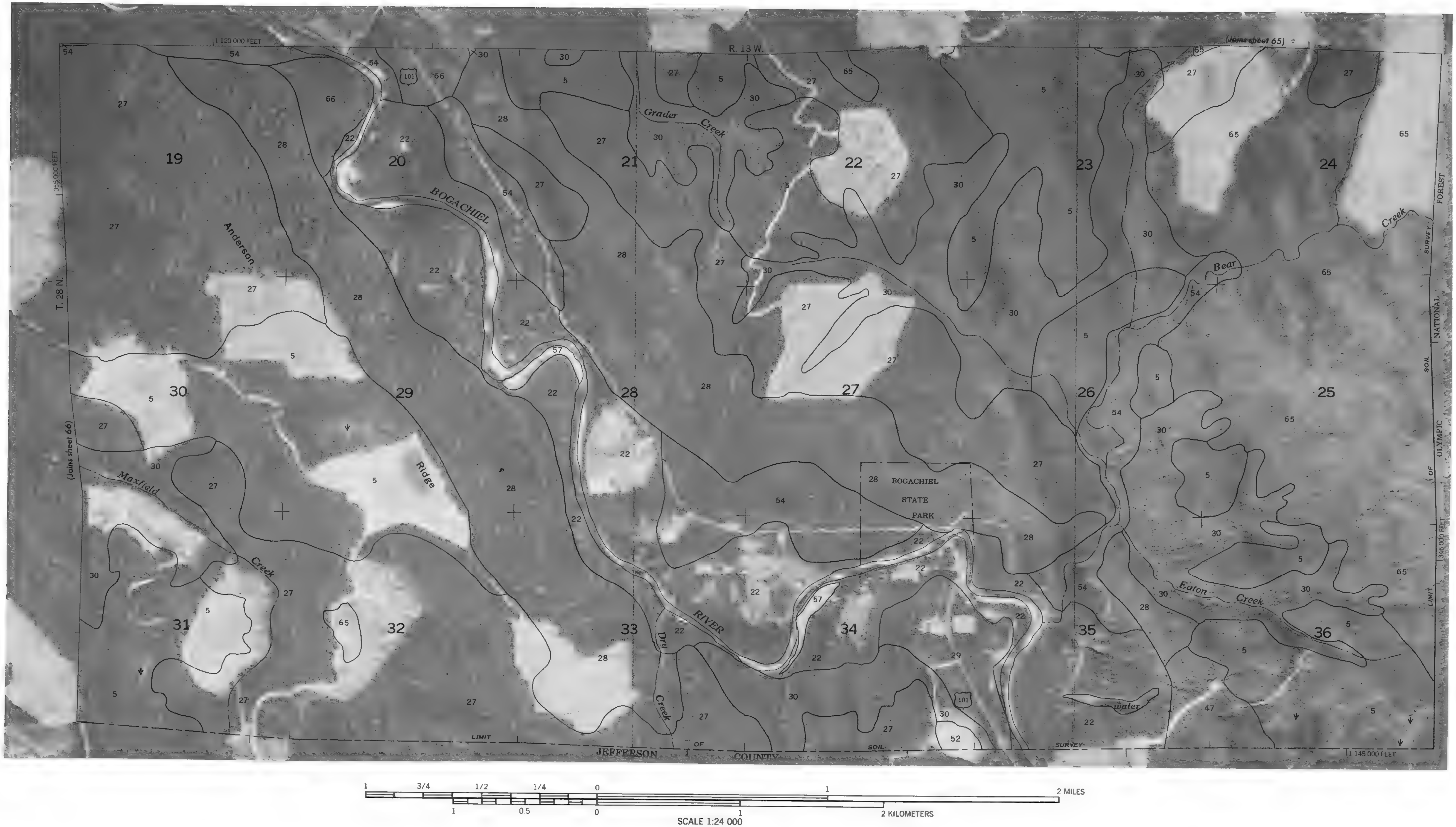


1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

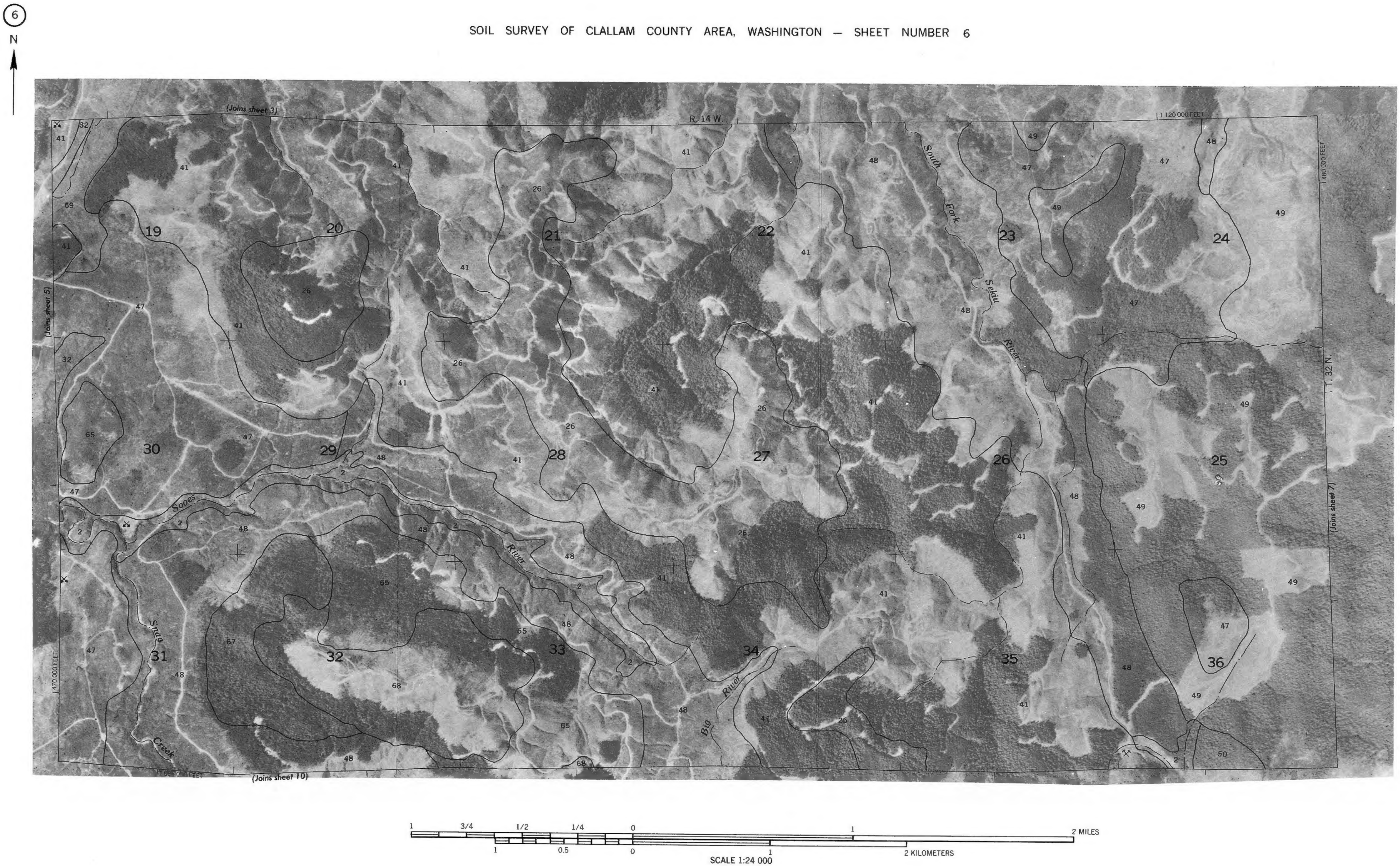
SCALE 1:24 000

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 66

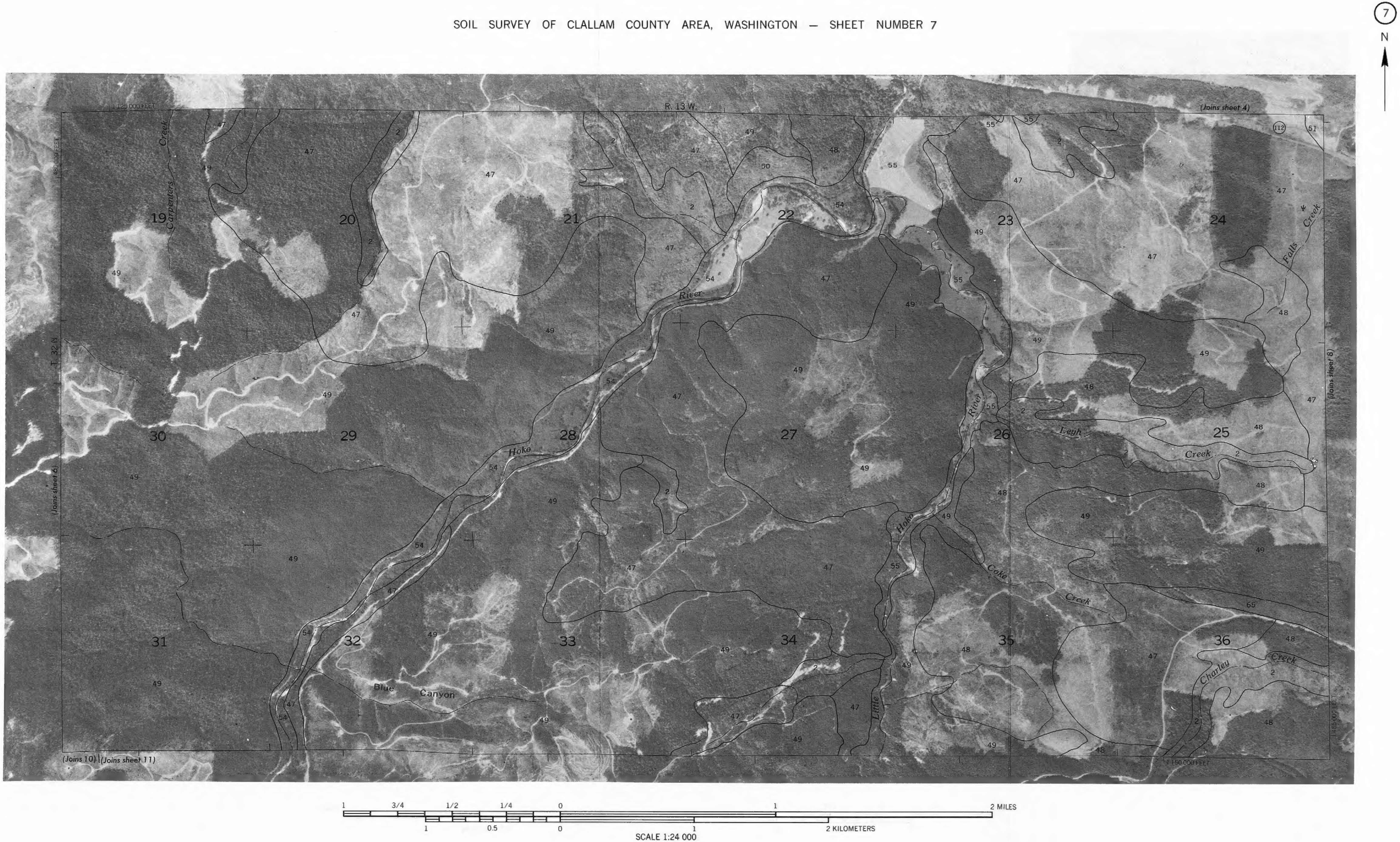

N
(Joins sheet 65)
R. 13 W.
T. 28 N.
(Joins sheet 66)
BOGACHIEL
RIVER
Anderson
Ridge
Maxfield
Creek
Grader
Creek
Bear
Creek
Eaton
Creek
Dry
Creek
BOGACHIEL
STATE
PARK
water
101
SOIL SURVEY LIMIT OF OLYMPIC NATIONAL FOREST
LIMIT OF SOIL SURVEY
JEFFERSON COUNTY
1 120 000 FEET
1 145 000 FEET
355 000 FEET
345 000 FEET

1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

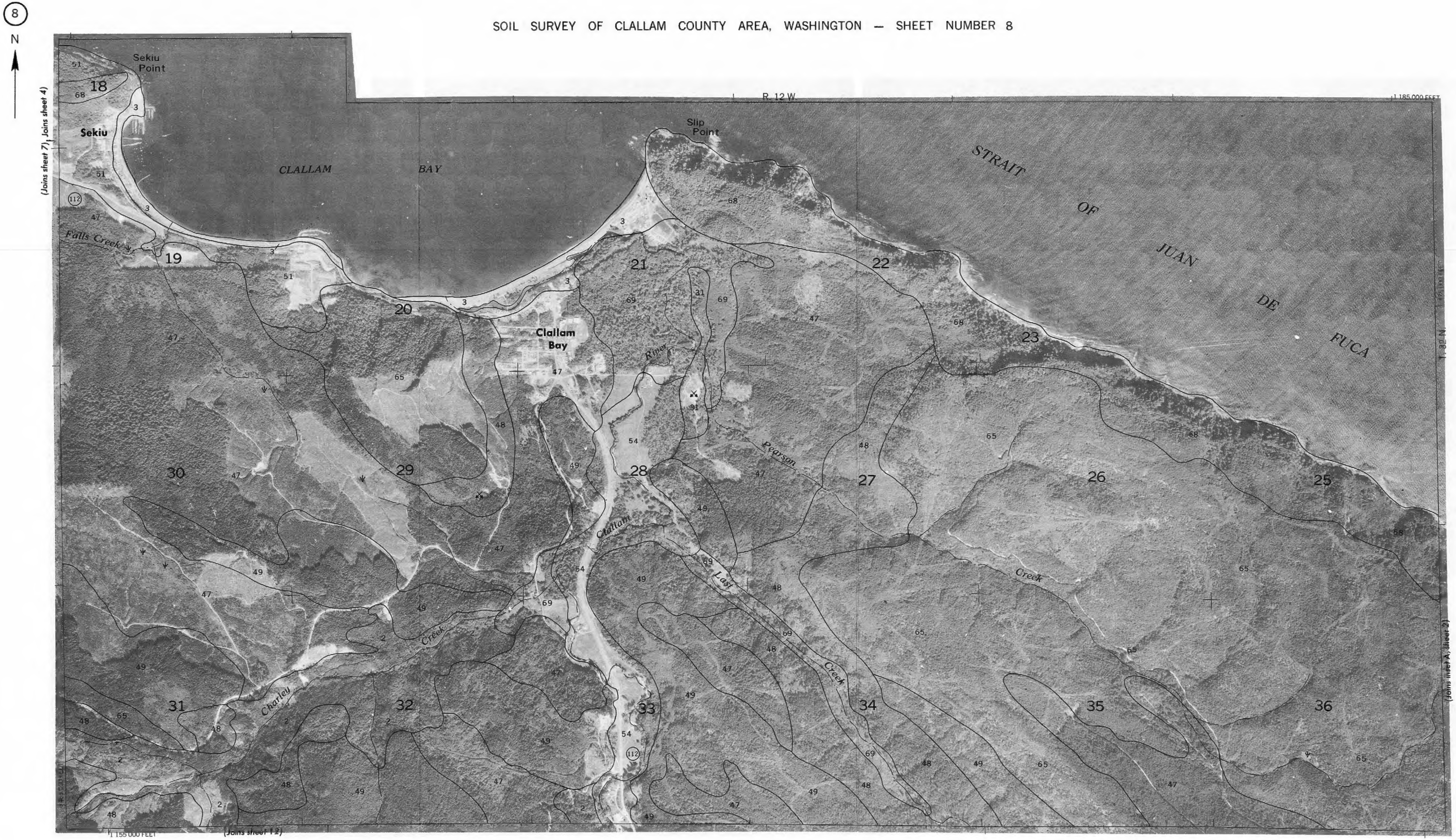
SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 6



SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 7



SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 8



1 3/4 1/2 1/4 0 1 2 MILES

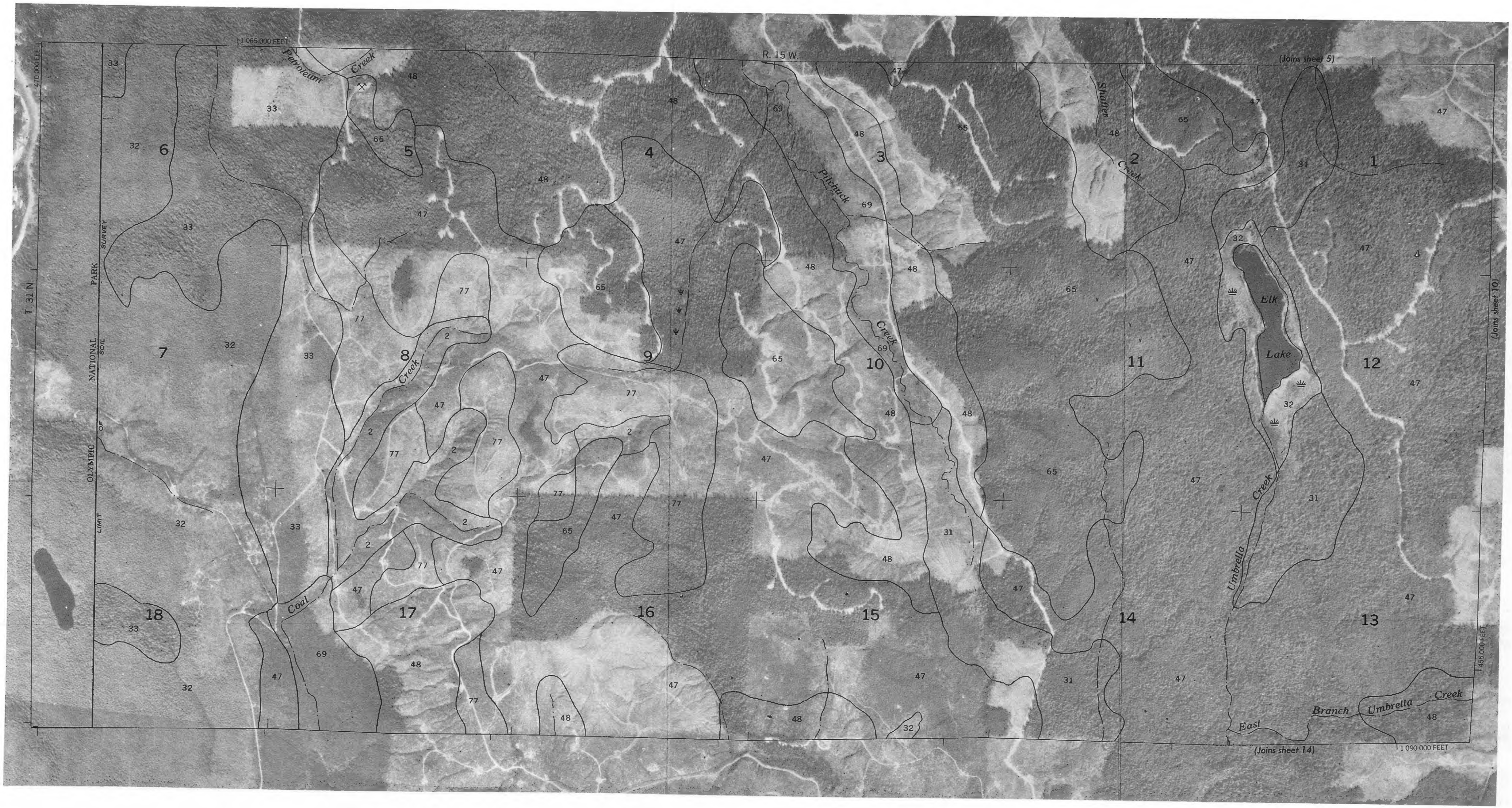
1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

SOIL SURVEY OF CLALLAM COUNTY AREA, WASHINGTON — SHEET NUMBER 9

9

N



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000